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# Uneven Pulse Adoption in SK and AB

## Interview Findings: Professional Agronomists and Certified Seed Growers





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# Executive summary

## SUMMARY OF RESEARCH

Our previous work has shown that the uneven pulse adoption in Western Canada cannot be solely attributed to agronomic conditions, as pulse adoption levels vary substantially across similar soil zones in Saskatchewan and Alberta (Nakuja, 2016). For example, lentil production abruptly stops at the administrative border between Saskatchewan and Alberta, even though there are similar agronomic conditions on both sides of the border. In these circumstances, we decided to further research pulse growers' decision-making processes with regards to lentil adoption, as well as their reasoning and motivations regarding new variety adoption in Saskatchewan and Alberta.

To answer these questions, we used the results of the paper-based lentil grower survey carried out in 2018 which indicate that growers' main reasons for growing lentils are crop rotation and price, and that growers trust and prefer to receive information on lentil growing mainly from producers' association, professional agronomists, seed growers and university sources. Based on these findings and our research goals of understanding the divergence in lentil adoption in both provinces, we developed semi-structured interviews addressed to certified seed growers and agronomists from both Saskatchewan and Alberta.

The interview designed for Saskatchewan seed growers and professional agronomists was focused on lentils' production and adoption. As only a smaller number of Alberta farmers grow lentils compared to their Saskatchewan counterparts, we had to formulate their questions on a different pulse crop that could be compared and contrasted with lentils. As dry pea is a major pulse crop grown in both Saskatchewan and Alberta, we have chosen to use the 'dry pea' or the 'field pea' as a comparator crop in Alberta.

Briefly, the goals of the interviews were to identify specific people or conditions that motivated farmers to grow lentils in SK versus growing dry peas in Alberta, the institutional support for the expansion of lentil and dry pea acres, as well as specific production issues that growers from both provinces have been experiencing with pulses. Furthermore, we wanted to get certified growers' and professional agronomists' opinions from both provinces on why SK producers prefer to grow lentils while Alberta producers prefer to grow dry peas.

The following table summarizes the main findings of the conversations we had with the four groups. The questions and the findings are presented for both categories, professional agronomists and certified seed growers from the two provinces. Considering interviewees' main occupation, the questions are slightly different for each group.

## INTRODUCTION

This research was undertaken as an in-depth study of lentil growers' behaviour. The initial GE3LS' research focus was to identify the various factors that influence producer decision-making processes and that contribute to an effective communication and knowledge exchange, with the aim of optimizing greater farmer adoption of new lentil varieties. Further, this study also focused on revealing the reasons behind the uneven pulse adoption in Western Canada, particularly in Saskatchewan (SK) and Alberta (AB).

## OBJECTIVES

In this context, we built our present research on the 2018 farmers' survey findings, which indicated that growers' main reasons for growing lentils are crop rotation and price, and that growers trust and prefer to receive information on lentil growing mainly from producers' association, professional agronomists, seed growers and university sources. Survey respondents did not answer all survey questions, which hindered us from further analysis. Therefore, we decided to pursue supplemental research. Thus, during the summer of 2019, we carried out semi-structured interviews with professional agronomists (PAgs) and certified seed growers (CSG) to understand growers' decision-making with regards to pulse adoption and to understand the divergence in lentil adoption rates between Saskatchewan and Alberta.

## METHODOLOGY

We employed semi-structured interviews addressed to certified seed growers and professional agronomists/agrologists located in SK and AB, who were formally registered as growing lentil or dry pea seeds, and respectively, offering professional advice on lentil or dry pea, as of June 1st, 2019. Each group of interviewees were asked, over the phone, five main questions, followed by prospective follow-up questions, if required.

## MAJOR FINDINGS OF THE INTERVIEWS

***Saskatchewan Professional Agronomists/Agrologists***

- SK agronomists had a wide range of answers on the **difficulty of lentil growing compared to other pulse crops, particularly dry peas**. Most of them explained the difference in moisture between AB and SK, further motivating that lentils have serious disease issues, which can be very easily triggered by moisture. The lack of aeration for lentils' canopy and the difficulty of spraying lentils because of the canopy density were pointed out. Other reasons mentioned were related to the weed control issues that lentils have and the need for specialized equipment for seeding and harvesting.
- Agronomists believe that **SK farmers are motivated to choose to grow lentils instead of other pulse crops** mainly because of lentils' higher price compared to other pulse crops, because of good emergence right after seeding, and their drought tolerance. Other reasons were related to SK farmers' tradition and experience in growing lentils, as well as lentils being much better adapted than other pulse crops in the dry regions and brown soils common in SK.
- We also asked SK agronomists **what kind of institutional support they believe was crucial for the development of lentil production in their province.** A few of the interviewees associated the term institution to a person, namely Dr. Albert Slinkard, and acknowledged the impact of his knowledge and communication skills on farmers' decision-making processes back in the 1970s.

SK agronomists also mentioned the Crop Development Center (CDC) and Saskatchewan Pulse Growers (SPG). A couple of respondents had seen this question as an opportunity to convey messages about what they would like or hope to see improved with regards in future lentil varieties, such as disease resistance traits and varieties that are adapted to a wider range of climate conditions.

- **When asked why AB farmers prefer to grow dry peas and not lentils, SK interviewees** mostly based their answer on the moisture and climate difference between the two provinces. Other interviewees mentioned that AB farmers did not have the SK cultural factors and tradition that began with Dr. Al Slinkard and have been continued by the plant breeders' team currently working at the U of S. Detailed explanations were offered about the positive financial impact of the AB oil industry in the overall province economics (aka the Dutch disease), as well as on the existence of a strong and constant demand from the cattle feed industry, which is a significant market for AB dry pea growers.
- **At the end of the interview, a few interviewees** identified ways to increase lentils adoption. Those who responded asked for more and improved herbicide options for lentils, and for adding new and improved lentil varieties such as breed tolerance and a (more) determinate growth pattern.

### *Saskatchewan Certified Seed Growers*

- **SK certified seed growers were asked whether they can recall specific people or conditions that influenced their decision to grow lentils**. A few of them mentioned that Dr. Al. Slinkard was the key person who encouraged them to grow lentils. Some interviewees noted that growing lentils is a family tradition, or it was triggered by the low wheat prices in the 1980s.
- Seed growers were invited to share their opinions **on the crucial support for the development of lentil production in SK**. Most of the growers acknowledged CDC and SPG, and their pulse breeding programs providing strong and trustworthy institutional support.
- Further, SK seed growers were asked **whether they find it more difficult to grow lentils than other pulse crops**. Most of the interviewees answered affirmatively to this question. Their reasons were mainly related to lentils' low height and the damage produced on the agricultural machinery during harvest. In contrast, a couple of growers advocated that with the current lentils' varieties available, along with the evolved agricultural technology, growers should not find lentil growing more difficult than other pulse crops.
- SK CSG were asked **who they talk to about growing lentils**. As expected from the paper-based survey, few growers talk to other growers, to their neighbours, or access information from Saskatchewan Ministry of Agriculture, and Agriculture and Agri-Food Canada. A few growers acknowledged that when they have questions, they contact Dr. Bert Vandenberg and other plant breeders and researchers involved in pulse breeding at the U of S. Their answers illustrate the importance of frequent and open communication between plant breeders, researchers and growers, as well as growers' need to learn and understand the most recent pulse breeding solutions or challenges.
- **SK growers were asked why AB farmers prefer to grow dry peas and not lentils.** A majority of interviewees indicated climate related reasons and dry pea's physiological advantages over lentils, such as height and standability. Another big motivation acknowledged by a few of the

interviewees was the large cattle industry in AB, and thus the substantial demand for animal feed. Dry peas had an advantage over lentils with larger volume, which translates into more money. Also, both lentils and peas may lose grade very easily. If this happens to peas, they are simply transferred from human consumption to animal feed, and AB growers would still make a good return per acre.

- When asked if they would like **to add anything to the conversation**, one of the seed growers took the opportunity to request lentil varieties that are herbicide tolerant. Another interviewee shared hopes for the future of pulse industry to diversify the uses of pulses in human consumption, so that overall pulse demand would further increase.

### *Alberta Professional Agronomist/Agrologist*

- The first question asked AB agronomists **how difficult they consider dry pea growing compared to other pulses, such as lentils**. Most of the interviewees stated that dry peas are easier to grow than lentils, as AB climate is a better fit for dry peas, and seeding and harvesting present fewer complications because of dry peas' physiological attributes. They also mentioned AB growers' experience, tradition, as well the existing market demand in AB.
- Next, respondents were asked **what motivates AB farmers to grow dry peas instead of other crops**. The most mentioned reason was the well-established AB feed markets that make producers feel they have a safety net if dry pea production loses grade. They also acknowledged AB growers' experience and tradition, the crop rotation benefit and, as expected, the price of dry peas. A couple of interviewees explained that southern AB, where lentils would be a good fit in terms of soil and climate, is mostly irrigated and thus growers prefer to grow the higher value peas rather than lentils.
- The next interview question asked agronomists **whether dry pea growers get in touch more often for information.** The answers were quite concise even if divergent. Some interviewees stated that growers do not ask them questions, as peas have been around for a while, while some others said they do receive more questions about dry peas as this is the largest grown crop in their area. One agronomist stated that he has been receiving more questions about lentils. He explains that growing lentils in AB soil zones and moist climate is still not well understood and/or researched, so AB growers are not sure what to expect if they start growing lentils.
- With regards to **institutional support crucial for the development of dry pea production in AB**, most agronomists indicated that AB Pulse Growers and AB Agriculture had been an instrumental support since the establishment of the crop. A few interviewees acknowledged the responsibilities undertaken by the innovators who first agreed to grow dry pea in their province, their willingness to take risks, and how innovators have been a crucial support in developing the dry pea industry in AB.
- Next, **respondents were asked if they know why SK farmers prefer to grow lentils**. A majority of interviewees believe that SK farmers prefer to grow lentils because of the drier climate, the profitability of the crop, the lack of alternatives in SK compared to AB, and the lack of irrigation. A few respondents brought up Dr. Al Slinkard's instrumental support for lentil development in SK, support that has been continued through Dr. Bert Vandenberg and the U of S pulse breeding team.

- At the end of the interview, **when asked to add any comments or thoughts to the interview**, one of the interviewees emphasized that, because of relatively limited pulse research in AB, they rely on pulse research developed in SK. Another interviewee suggested how pulse adoption could/should be planned and developed in AB.

### *Alberta Certified Seed Growers*

- The first interview question asked AB seed growers **what influenced their decision to grow dry peas.** Most interviewees briefly referred to the crop rotation needs, family traditions, and potential return.
- Interviewees acknowledged that the **main institutional support for the development of dry peas in AB** was provided by Alberta Agriculture, Alberta Pulse Growers, private agronomists, or even buyers who provided agronomic support and marketing information. A few respondents expressed their regret that AB extension support has been discontinued and they have to rely on private agronomists. Other sources of institutional support mentioned by interviewees were the U of S CDC, Agriculture and Agri-Food Canada and the research stations in AB, such as Lacombe and Lethbridge.
- When asked **whether they find it more difficult to grow dry peas compared to other pulse crops**, a majority of respondents acknowledged that dry peas are easier to grow compared to lentils or any other pulse crops.
- The next question asked interviewees **who they talk to when they have questions about growing dry peas**. Most respondents stated that they have appropriate support or advice for growing peas. Certified seed growers usually ask for advice from staff or attend events organized by Alberta Agriculture, Alberta Pulse Growers, and Agriculture Canada. Almost all of them have mentioned consulting with local representatives of companies that sell herbicides or fungicides, as well as with research staff from AB research stations. However, regarding regular dry pea production activities and agronomics, respondents rely mostly on private agronomists. A couple of respondents indicated that they are not able to access enough information about lentils as they just started growing lentils in an area in AB where other farmers grow only dry peas.
- A majority of AB seed growers believed **SK farmers prefer to grow lentils** due to the SK conducive climate for lentil production, particularly the higher number of heat units per year and the reduced moisture that SK gets compared to AB. Additionally, interviewees believe that SK farmers grow lentils because of their price. A couple of respondents suggested that the market demand for lentils in SK, as well as the lack of demand alternatives (e.g. feed market) drive SK farmers to grow lentils.
- When asked what else they **would like to share during the interview**, one grower asserted that the 1991 Gross Revenue Insurance Program (GRIP), a provincial government program in AB designed to encourage lentil growing, which failed to stimulate lentil growing in the province. The areas where lentils were grown were not suitable for lentil production and the growers were unexperienced. He/she concluded that AB farmers have not grown lentils since as a result of this negative experience.

# 1. Introduction and background

The present research was designed to obtain additional information regarding SK pulse grower decision-making processes with regards to lentil adoption. Previous GE3LS investigation and economic modeling have not answered all our initial research hypothesis. Our research has shown that the uneven pulse adoption in Western Canada cannot be solely attributed to agronomic conditions, as pulse adoption levels vary substantially across similar soil zones in Saskatchewan and Alberta (Nakuja, 2016). For example, lentil production abruptly stops at the administrative border between Saskatchewan and Alberta, even though there are similar agronomic conditions on both sides of the provincial border.

To explore this, a paper-based lentil grower survey was carried out in 2018 with semi-structured interviews addressed to seed growers and agronomists from both SK and AB. The interview designed for SK seed growers and professional agronomists was focused on lentil production and adoption. As only a smaller number of AB farmers grow lentils compared to their SK counterparts, we had to formulate their questions on a different pulse crop that could be compared and contrasted with lentils. As dry pea is a major pulse crop grown in both SK and AB, we have chosen to use the 'dry pea' or the 'field pea' as the comparator crop in AB.

For a clearer picture of the results presented in this study, we considered it important to remind the reader how production and yield for lentils and dry pea have evolved in both provinces for the past 10 years. Tables 1 and 2 present the seeded area, production and yield for lentils and dry pea in SK and AB between 2009 and 2018.

**TABLE 1. LENTILS' SEEDED AREA, PRODUCTION AND YIELD 2009-2018 IN SK AND AB**

| *Lentils* | *2009* | *2010* | *2011* | *2012* | *2013* | *2014* | *2015* | *2016* | *2017* | *2018* |
|---|---|---|---|---|---|---|---|---|---|---|
| | ***Seeded area (thousand acres)*** | | | | | | | | | |
| ***SK*** | *2,355* | *3,340* | *2,460* | *2,420* | *2,620* | *3,010* | *3,750* | *5,105* | *3,920* | *3,345* |
| ***AB*** | *50* | *105* | *97.8* | *85* | *100* | *110* | *285* | *575* | *485* | *420* |
| | ***Production (thousand tonnes)*** | | | | | | | | | |
| ***SK*** | *1,497* | *1,923* | *1,498* | *1,470* | *2,154* | *1,903* | *2,364* | *2,742* | *2,294* | *1,892* |
| ***AB*** | *33.4* | *82* | *76* | *68.1* | *110.3* | *84.4* | *176.4* | *506.2* | *264.4* | *199.6* |
| | ***Yields (pounds per acre)*** | | | | | | | | | |
| ***SK*** | *1,413* | *1,312* | *1,384* | *1,351* | *1,824* | *1,446* | *1,392* | *1,167* | *1,297* | *1,270* |
| ***AB*** | *1,476* | *1,774* | *1,715* | *1,807* | *2,558* | *1,724* | *1,375* | *1,993* | *1,207* | *1,048* |

Source: Government of Saskatchewan, 2018 Specialty Crop Report

Table 1 illustrates the significant difference between the lentil seeded area, and implicitly production levels, between SK and AB, where SK is the unequivocal leader, with approximately 95% of all Canadian lentils are grown in SK (Peiris, 2019). A peak year for both provinces was 2016, when each province seeded the highest number of acres up to date. Since 2016, as lentil prices fell, seeded area and production slowly decreased in both SK and AB. With only a few exceptions, AB farmers have been obtaining higher yields per acre compared to SK.

**TABLE 2. DRY PEAS' SEEDED AREA, PRODUCTION AND YIELD 2009-2018 IN SK AND AB**

| *Dry pea* | *2009* | *2010* | *2011* | *2012* | *2013* | *2014* | *2015* | *2016* | *2017* | *2018* |
|---|---|---|---|---|---|---|---|---|---|---|
| | ***Seeded area (thousand acres)*** | | | | | | | | | |
| ***SK*** | *2,875* | *2,610* | *1,700* | *2,600* | *2,265* | *2,600* | *2,135* | *2,180* | *2,165* | *1,935* |
| ***AB*** | *800* | *935* | *707* | *1,075* | *1,000* | *1,300* | *1,445* | *1,845* | *1,800* | *1,511* |
| | ***Production (thousand tonnes)*** | | | | | | | | | |
| ***SK*** | *2,613* | *1,973* | *1,671* | *2,068* | *2,572* | *2,256* | *1,779* | *2,346* | *1,974* | *1,781* |
| ***AB*** | *667* | *983* | *806* | *1,208* | *1,321* | *1,475* | *1,315* | *2,271* | *1,992* | *1,608* |
| | ***Yield (bushels per acre)*** | | | | | | | | | |
| ***SK*** | *33.8* | *29.8* | *36.4* | *30.0* | *42.4* | *32.5* | *30.9* | *40.1* | *33.8* | *34.5* |
| ***AB*** | *32.7* | *39.0* | *42.6* | *41.9* | *48.8* | *42.0* | *34.0* | *46.1* | *40.9* | *39.9* |

Source: Government of Saskatchewan, 2018 Specialty Crop Report

Table 2 shows that, over the past ten years, AB farmers have adopted more dry peas' in their crop rotations, getting close to the number of acres seeded in SK. However, AB yield is undeniably better off than SK's as the number of bushels that growers obtain in AB has been higher than in SK for the past nine years, at least partly because more irrigation is used in AB.

# 2. Objectives

Given the above, we decided to further research pulse growers' decision-making processes, as well as their reasoning and motivations regarding new variety adoption in SK and AB. Thus, we carried out semi-structured interviews with professional agronomists and certified seed growers from both provinces to further understand growers' decision-making behaviour and to understand the divergence in lentil adoption rates between Saskatchewan and Alberta.

The goal of the interviews was to identify specific people or conditions that motivated farmers to grow lentils in SK versus growing dry peas in AB, the institutional support for the expansion of lentil and dry pea acres, as well as specific production issues that growers from both provinces have been experiencing with pulses. Furthermore, we wanted to get certified growers' and professional agronomists' opinions from both provinces on why SK producers prefer to grow lentils while AB producers prefer to grow dry peas.

# 3. Methodology

We have designed semi-structured interviews addressed to certified seed growers and professional agronomists/agrologists located in SK and AB who are formally registered as growing lentil or dry pea seeds and, respectively, offering professional advice on lentil or dry pea.

Following best qualitative research practices (Jamshed 2014, Elliot 2018), we asked respondents pre-set open-ended questions followed up by 'why' and 'how' questions. We have chosen this interview format as we wanted interviewees to feel free to discuss ideas, reasons and experiences as they come up during the interview. Williams (2015) suggests employing semi-structured interviews when wanting to know the independent thoughts of everyone, and on topics where respondents may avoid sharing their thoughts if sitting in with peers in focus groups.

Besides the list of questions for each category of interviewees, based on the paper-based survey results we prepared a framework of themes to be explored and an interview guide (Williams, 2015). Qualitative research theory recommends that a lower number of questions, and implicitly, a relatively shorter interview may insure a higher rate of interview participation. Thus, we decided to have five main questions, followed by prospective follow-up questions to be asked by interviewers. During the interview trial runs we estimated that the interview length could be anywhere between 15 to 30 minutes. The interview questions along with an Ethics application package were submitted to and approved by the U of S Ethics board at the beginning of June 2019 (Behavioral ID #1073).

Table 3 shows the semi-structured interview questions for both categories of interviewees in each province. As previously mentioned, the interview questions for certified seed growers focused on farmers' decisions to grow lentils/dry pea, institutional support, comparing and contrasting lentils with dry pea growing, access to support when needed, and finally, growers' opinion on why farmers on the other side of the border prefer to grow 'the other crop'. The questions for professional agronomists, as well as the order of the questions, were slightly different as we were asking their professional opinion about the same issues.

**TABLE 3. INTERVIEW QUESTIONS FOR PAGS AND CSG FROM SK AND AB**

| | ***Saskatchewan*** | ***Alberta*** |
|---|---|---|
| ***Professional Agronomist/ Agrologist*** | 1. *How difficult do you consider lentil growing compared to other pulse crops, for instance dry peas? Why?*<br>2. *What do you think motivates SK farmers to choose to grow lentils instead of other pulse crops?*<br>3. *Do you find lentil growers get in touch with you for information on lentil growing more often than other pulse growers?*<br>4. *In your opinion, what kind of institutional support was crucial for the development of lentil production in SK?*<br>5. *Currently, in AB, the main pulse crop grown is the dry pea. Do you have any idea why Alberta farmers prefer to grow dry pea, and not lentils?* | 1. *How difficult do you consider dry peas growing compared to other pulse crops, for instance lentils? Why?*<br>2. *What do you think motivates AB farmers to choose to grow dry peas instead of other pulse crops?*<br>3. *Do you find dry pea growers get in touch with you for information on dry pea growing more often than other pulse growers?*<br>4. *In your opinion, what kind of institutional support was crucial for the development of dry pea production in AB?*<br>5. *Currently, in SK, the main pulse crop grown is lentils. Do you have any idea why SK farmers prefer to grow lentils?* |
| ***Certified Seed Growers*** | 1. *Do you recall any specific people or conditions that influenced your decision to grow lentils? If not, very briefly, what motivated you* | 1. *Do you recall any specific people or conditions that influenced your decision to grow dry peas? If not, very briefly, what motivated you to* |

| | | |
|---|---|---|
| | *to start growing lentils?*<br>2. *In your opinion, what kind of institutional support was crucial for the development of lentil production in SK?*<br>3. *Do you find it more difficult to grow lentils than other pulse crops? Have you tried to grow dry peas? If yes, which of the two crops is easier to grow? Why?*<br>4. *Who do you talk to when you have questions about growing lentils? Do you find that you have access to the appropriate support or advice for growing lentils?*<br>5. *Currently, in AB, the main pulse crop grown is the dry pea. Do you have any idea on why AB farmers prefer to grow dry pea, and not lentils?* | *start growing dry peas?*<br>2. *In your opinion, what kind of institutional support was crucial for the development of dry pea production in AB?*<br>3. *Do you find it more difficult to grow dry peas than other pulse crops? Have you tried to grow lentils? If yes, which of the two crops is easier to grow? Why?*<br>4. *Who do you talk to when you have questions about growing dry peas? Do you find that you have access to the appropriate support or advice for growing dry peas?*<br>5. *Currently, in SK, the main pulse crop grown is lentils. Do you have any idea on why SK farmers prefer to grow lentils?* |

Once the U of S Ethics board approved our interviews, recruitment emails were sent to potential participants. As we wanted to reach out to as many participants as possible from both provinces, we emailed invitations to all seed growers and professional agronomists whose email addresses were available as online public information. Due to U of S Ethics regulations regarding participants' protection of anonymity and confidentiality, once the interview invites were sent out, we had to wait until those interested would email us back to express their willingness to participate in our phone interviews. Once they had agreed and read the letter of consent, we arranged for an interview day and time. Two graduate students at the Johnson Shoyama School of Public Policy were hired as summer research assistants to conduct and transcribe the interviews.

Recruitment emails and two sets of reminders for each potential respondents' category were sent between June 16th and July 23rd, 2019, while interviews were conducted until August 1st, 2019. We sent invites to 40 professional agronomists and 73 certified seed growers from SK, and to 38 professional agronomists and 19 certified seed growers from AB, adding up to a total of 170 potential respondents. There is a significant difference between the number of potential CSGs identified in SK and AB. While the Saskatchewan Pulse Growers Association website contained updated information and current email addresses of the formally registered CSG and PAgs, Alberta Pulse Growers' website did not have such information available to the public, which challenged constructing the AB database of potential respondents. By August 1st, 2019, a total of 34 interviews were conducted, with 10 PAgs and 7 CSG from SK, and 10 PAgs and 7 CSG from AB.

According to the literature, when conducting qualitative work, researchers can determine the 'right' sample size once the point of saturation has been reached. Data saturation occurs when no new information is received from interviewers, when similar instances keep repeating and there are no new

themes that emerge from interviews (Saunders et al., 2018). When more data is accumulated by increasing sample size, but it does not lead to more information, it is called the point of diminishing returns (Mason, 2010). The data we obtained as of August 1st, 2019 revealed that no new emerging themes were occurring, so we decided to stop interviewing.

# 4. Coding

Coding is a fundamental part of the analytical process which allows researchers to break down extensive interview data into categories, themes and nodes and re-organize it and analyze it (Elliot, 2018). Codes are used to label a certain meaning to descriptive or inferential information (Miles et al. 2014) and to reduce information contained in hours of interview transcripts to manageable data. Coding can be done using preset or a priori codes, as well as codes that 'emerge' from the data, often referred to as post priori or emergent codes (Punch, 2014). Creswell (2013) encourages researchers to utilize both types of coding as emergent coding may contain valuable information needed to refine data analysis. Creswell (2013) explains that 'several codes aggregated to form a common idea' are used to obtain categories or themes. Categories can be further grouped into major concepts (Lichtman, 2013).

In the recent literature of qualitative research, it is suggested that to increase reliability, interviews should be coded by hand first, and only then by using specialized software (Elliot, 2018). With the same aim, some authors advocate that interview data should be coded by multiple researchers involved in the project who should attain coding agreement (Miles et al. 2014; Richards, 2015).

Thus, in our analysis, with the goal of achieving data reliability, the interviews were coded by hand first using a-priori codes and emergent codes by the research lead. The a-priori codes were obtained from the 2018 paper-based surveys results. In parallel, our summer research assistants coded the interviews in NVivo 12 using emergent codes. To wrap up data analysis, the research lead also coded the interviews in NVivo using both types of coding, and further verified reaching coding agreement with the other researchers.

NVivo is a qualitative data analysis software developed by QSR International. This software supports researchers to systematically search and arrange interview transcripts or other video and audio materials; it helps to organize, reduce, and store the data used in qualitative analysis (Wong, 2008). According to Wong (2008), researchers are designing categories, codes, identify patterns, and explain results, whereas NVivo is used to code, retrieve codes, and group data according to established themes.

# 5. Data analysis

Structuring qualitative data results obtained from ample interviews can be challenging. However, for a clearer picture of the results, we decided to present the findings for each group (e.g. professional agronomist from SK, certified seed grower from SK, professional agronomist from AB, certified seed grower from AB) and for its respective set of questions.

While quantitative research methods are employed to find out the frequency or duration of certain behaviour (Sutton and Austin, 2015), qualitative research methods reveal attitudes, beliefs, and motives and explain why and how these behaviours occur (Castleberry and Nolen, 2018). Therefore, in contrast to our previous quantitative analysis of the paper-based surveys, the focus of our findings will not be on

responses' frequency, even though sometimes this should be mentioned when analyzing data, but on why and how respondents' stories develop, their reasoning, attitudes, observations and needs. Quantitative and qualitative methods each have strengths and limitations and can easily polarize researchers on opposing views about which one brings most knowledge with regards to the research questions. However, when used together, by researchers aware of their individual shortcomings, they enrich findings (Chiang et al. 2015). A growing body of literature confirms that using both quantitative and qualitative research methods increase research results' reliability and understanding (Burke and Johnson 2004, Anderson 2010).

Further, the qualitative research literature abounds in examples and recommendations to present findings, rather than results, and "findings should be written as if a story is being told; as such, it is not necessary to have a lengthy discussion section at the end" (Sutton and Austin, 2015). This is the reason why, unlike quantitative methods, qualitative research findings should not be generalizable to an entire or specific part of a population (Castleberry and Nolan, 2018).

In addition, qualitative research literature recommends that when presenting qualitative research findings, to use and select interviewees' most poignant and representative research statements (Anderson 2010). These quotes should be relatively short and cleaned up of repetitive statements as well as of information that may lead to identifying the interviewee.

Many qualitative research authors do not recommend drawing/writing conclusions after performing data analysis, as the researcher may give an unintentional, and perhaps different twist to interviewees' story, but rather report and briefly discuss the findings. They suggest allowing interviewees' 'voices' to get through to the reader using their own words. In this context, we included in this report the most representative quotes of the interviewees. This means that we included quotes that show interviewees converged, or unique points of view, as well as contradictory statements. We 'cleaned up' the quotes of repetitive words and expressions, and of any hints or information that may lead to interviewees identification. For the same reason, throughout the report, we use the pronouns 'he' or 'she' or 'he/she' – 'his/hers' completely randomly.

## 5.1 Saskatchewan Professional Agronomists/Agrologists

### *5.1.1 How difficult do you consider lentil growing compared to other pulse crops, especially dry peas? Why?*

As previously mentioned, ten professional agronomists from SK agreed to be interviewed. The first question asked interviewees how difficult they consider lentil growing compared to other pulse crops, especially dry peas, and why they think so.

Their range of responses varied widely, from two respondents stating that there is no difference between lentil and dry pea growing as they are similar, to '*maybe slightly more difficult*' where the differences were explained in terms of each pulse crop's adaptability to local environment and adaptive region, as well as physical differences between lentils and dry peas. Interviewees who considered growing lentils '*difficult*' and '*more difficult*' explained that lentils need special seeding equipment, because the land where lentils are grown has to be rolled, and because of special harvesting equipment needed (i.e.: the flex header).

There were respondents who ranked the level of difficulty '*a little more difficult*' or '*slightly harder*'. Their opinions and explanations converged on the lentil disease growing due to climate, particularly in a moist season or area:

"[…] *You would think that lentils naturally grow in areas that don't tend to get a lot of disease, but lentils have a very, very dense thick canopy that traps moisture. Even a small amount of moisture from small evaporation of the soil is sufficient to induce this disease, whereas in most other crops, they're more aerated […]. The breeze below that (dry peas) canopy dries out a disease and it won't develop. In lentils, that doesn't happen, so we have a very dense canopy that harbors the disease even in dry climates, so yeah, Saskatchewan has a disease problem with lentils, no question*. […]".

Another agronomist motivates his/her answer with weed control issues and complications of lentils compared to dry pea:

"[…] *It is a little more difficult because (of) herbicide challenges and crop competition, peas will be a little more competitive. The main issues I see is weed resistance, like it was really nice when we had Clearfield chemistry for lentils, but now that we're breaking down into group 2 resistance specifically with things like group two mustard, it's becoming a little more difficult to manage lentils, whereas in peas there's options to actually control group two mustard for example. Or even if you get into group two cleavers or something like that, there is some chemistry options, where if you're getting really heavy mustard in lentils, you're pretty much on that field you can't grow lentils anymore because there's so much mustard in it that it's, you're just not gonna be profitable* […]."

### *5.1.2 What do you think motivates SK farmers to choose to grow lentils instead of other pulse crops?*

Further in the interview, professional agronomists were asked what motivates SK farmers to choose to grow lentils instead of other pulse crops. Their responses were quick and quite straight forward. Seven of them mentioned lentil price as the main and unequivocal reason. Other responses revolved around lentil variety traits such us: '*good immersions right off the bat after seeding*', '*drought tolerance*' and lentils are '*more adapted to the brown, dark brown soil region of the prairies*'. Other reasons included: SK farmers' ability and tradition growing lentils, the cleanliness of land (in terms of lack of stones, lack of insect pressure), and the existence of a market for lentils and market conditions.

Another interviewee explains that in the 1990, following a severe drought and erosion events, the provincial government through its extension arm undertook a concerted effort to reduce tillage in the prairies. He/she believes that the invisible border between provinces is justified by SK's high adoption rates of zero tillage, compared to AB:

"[…] *one of the things that we noticed at zero tillage is that if you look at the regional distribution of the rates, it actually tends of higher level of adoption in lentil producing areas in southern, in brown, dark soil zones, than there are in the brown and gray soils. And some of this was driven by the soil water conserving effects of zero tillage, that they're more sensitive to stored soil moisture, so there was more, there was a stronger benefit for farmers in this area to adopt zero tillage and so that, and then lentils were very well adapted into that rotation, cause they could be, and there was a lot of research… 've noticed you know, maybe not back in the 1990s, 2000s, you could actually, you could tell where zero*

*tillage was at the border. There was a definite border effect. You definitely noticed more at adoption in Saskatchewan versus Manitoba or Alberta* […]".

### *5.1.3 Do you find lentil growers get in touch with you for information on lentil growing more often than other pulse growers?*

Next, SK professional agronomists were asked if they find lentil growers getting in touch with them more often than other pulse growers. Four of the agronomists simply answered '*No'* and '*about the same with other pulses*' to this question, reflecting that this is a crop that has been grown for a while in the province. Two other agronomists mentioned that lentil growers would definitely get in touch more often with questions about fungicide and, herbicide spraying:

"[…] *There's, it's a little more when it comes to fungicide applications, that disease, there's a little bit more that you need to do and know (in) lentils. When it comes to applying fungicides, because of the disease spectrum, peas usually get away with one application of fungicide, whereas lentils go usually at two applications systems. Sometimes at three, but that's where you get more questions is on fungicides and disease, sometimes weed control because we get into a few issues there, but usually there's a little more knowledge needed in growing lentils than peas* […]".

Another responded explained lentils' sensitivity to diseases and the burden of what seems to be incessant spraying:

"[…] *Lentils do not have a lot of herbicide options. There's some traditional herbicides with limited weed killing spectrum are required […] disease control is very important in lentils. So, lentils are very susceptible to a number of diseases and 30 some applications are required and sometimes you get yourself into a situation where you've committed yourself to spraying and you can't afford to stop, you know?* […]".

### *5.1.4 In your opinion, what kind of institutional support was crucial for the development of lentil production in SK?*

The next question asked agronomists what kind of institutional support they believe was crucial for the development of lentil production in SK. Notable that for this question (which will repeat for the other three groups of respondents) is even though the term 'institution' was used in its general meaning of an organization that enabled lentil development, a few interviewees have identified the term institution to a person, namely Dr. Albert Slinkard. The University of Saskatchewan Crop Development Centre (CDC) pulse breeding program began at the University of Saskatchewan when Dr. Albert Slinkard was hired in 1972, and in 1978, the CDC released their inaugural lentil variety (Laird). Indeed, institutions are made up of individuals, but when one individual is identified to an institution, particularly almost half a century later, it shows how strongly farmers' decision making was impacted by Dr. Slinkard's behaviour and knowledge.

"[…] *He actually helped, the newer varieties for Saskatchewan had less indeterminate growth than the older ones. So that was the biggest problem when lentils were starting to grow here* […]".

Not surprisingly, other interviewees have named the CDC in collaboration with Saskatchewan Pulse Growers (SPG), and their online support as very helpful:

*"[…] just for basic information crop staging, what to look for. Mainly for new growers but help for things that pop up like market access issues, you know, pre-harvest herbicides. Watch out for maximum residue, those are the ones that kind of tend to change every year, so, that's kind of what I use […]*".

A couple of professional agronomists highlighted the priceless support and communications undertaken by agricultural extension support, as well as the importance of specific agricultural equipment needed for lentil growing combined with zero tillage:

*"[…] There was a lot of institutional extension support that helped growers who had never grown anything but wheat before, deal with the crop that grows only 30 centimeters tall, and they had to worry about rocks and so on […] in areas like the area around Regina, Rosetown, land rollers allowed people to grow these crop […]. A lot of the work that we did in terms of our extension work for zero tillage and diversifying rotations was how we managed weed control, weeds and pests in these more diverse rotations […]."*

A few respondents focused on the breeding efforts undertaken in the province, on the actual outcome of institutions like CDC:

[…] *The Crop Development Center. Developing the varieties more suited to the area* […]

and even asked for specific traits that need to be incorporated in the future lentil varieties:

*"[…] I mean without question it's the breeding effort in lentils has, basically in all of our crops has been the most fundamentally important. We need cultivars that are resistant to disease. This is a much, much better strategy than cultivars that need to be sprayed for disease. We need cultivars that are adapted to a wider range of growing conditions. For example, if there is high rainfall areas, where we could expand into with lentil production, it's entirely a cult of our driven phenomenon, because of the disease question again, so yeah, that's number one. That's the constraint in my view. […]"* (Professional agronomist A).

Or, for example:

"[…] *I know it takes a long time to develop varieties, but it just seems like it's a really long time to get that next best thing that's kind of like a Maxim and it kind of surprises me a little bit that I would've thought that there'd be something new coming down the pipeline, but breeding takes time. I understand that and there is a new one now that's maybe taking over a little more which is Proclaim and I'm hoping that one is really good and kind of takes off from Maxim and that there's more in the future. I wish that there was a little more when it came to root disease resistance when it comes to the breeding coming in the future, as well as maybe more breeding on herbicide resistance or something like that or even on a herbicides found, they can be used to fight some of these weed issues* […]" (Professional agronomist B).

### *5.1.5 Currently, in Alberta, the main pulse crop grown is the dry pea. Do you have any idea why Alberta farmers prefer to grow dry peas, and not lentils?*

The following question of the interview asked agronomists why AB farmers prefer to grow dry peas and not lentils. Four of the interviewees largely based their answer on the climate difference between the

two provinces, highlighting the moist climate of AB compared to the dry SK climate. However, every one of them had given a different twist to their explanation, for instance, on climate conditions and tradition in AB.

*"[…] Well I drive through Alberta a lot, and you're absolutely right, I see beautiful pea fields and I see almost no lentil fields. And you know, maybe their region, their climate, and their tradition is they can grow excellent pea crops and everybody knows it, so that's what they do. I mean, peas happen to be a little more widely adapted. They can tolerate dry conditions as well as slightly wetter conditions, and lentils cannot tolerate wet conditions at all, so maybe that's it, but you're right, east-central Alberta, it's a dry area, it would be a natural place for lentils to be grown, but yeah peas got it right now. So probably is an economic battle. If they can grow 40, 50, 60 bushel pea crops why would they bother trying to make that with lentils, cause lentils is actually a more difficult crop to grow. You know?* […]" (Professional agronomist C)

or on the oil industry impact on AB economy and its effects on agriculture:

[…] *The economics in Alberta are perhaps different for many growers there compared to Saskatchewan and I kinda think it might be related to the oil industry's impact on farmers in that province and the amount of dollars that are available to growers from the oil industry who allow the pumping of oil on their land for money to take place so, the necessity to find, y'know a more sustainable higher value cropping sequence was not as pressing perhaps as it might've been in Saskatchewan. And it's because obviously we don't have as much oil production going on there as they do in Alberta so I kinda think it was all financially related and necessity is based on how strapped growers were for cash, and they might've been better off in Alberta because the oil industry* […] (Professional agronomist D).

Other interviewees simply mentioned that AB farmers do not grow lentils as they did not have the SK cultural factors and tradition that began with Dr. Al Slinkard and has been continuing with the plant breeder team currently working at the U of S. Whereas another respondent suggested that perhaps AB farmers' preferences may be related to their tradition and skill level, to their marketing companies or even the influence of their own agronomists. Another respondent explains the phenomenon through the existence of feed markets in AB:

"[…] *I think because there's an established feed market (in AB) as well, so if it isn't bought for, if peas aren't bought for... Human consumption, they can always sell them to the feed market.* […] *I would say mainly in Alberta there's the highest concentration of feedlots, so that's my feeling of the industry* […]."

### *5.1.6 Anything else to add?*

Last, but not the least, respondents were asked whether they would like to add anything else to the interview. While some of them reiterated or added more detail to what they have previously stated, some others expressed their needs related to lentils adoption:

"[…] *I just wish there was more herbicide options. That's the biggest thing with pulses, more herbicide options. But at the end of the day if we can make it, the more profitable it is for a grower, they'll deal with the herbicide options, but if it's profitable and easier to grow and control their weeds on the farm then they're gonna be more growing* […]" (Professional agronomist E)

or they offer valuable advice on future lentils adoption:

"[…] *But you know, I think it's just a question of what people are used to doing, what they've had past success with. Maybe leading farmers need to be maybe identified and perhaps used in a way if I can say that to pave the way perhaps for success. I think an economic case has to be made, obviously, that's the root of it all* […]" (Professional agronomist F).

Or express their needs with regards to new lentil variety development, such as breeding tolerance:

"[…] *Cause one of the comments I have […] is one of the diseases that's becoming more prevalent is Aphanomyces and we are I mean the fields I consult on I don't think there's very few acres left that don't have Aphanomyces. So, it's becoming a huge problem and there's no control for it. And the only we're ever gonna get control is to breed it, is to breed tolerance. So that's the only comment I have if we want to continue to have acres, I mean obviously dry pea is the same way, I mean it has as much trouble with Aphanomyces* […]" (Professional agronomist G)

Improved lentil physiology in terms of height and setting seeds, in other words controlling lentils' indeterminate trait:

*"[…] Well if you're getting too much moisture, the thing about a lentil is that a red lentil might grow say six to eight inches tall or it might grow two and a half feet. If it grows two and a half feet and you're getting too much moisture, what you'll get is all plant and hardly any yield, hardly any pods. So, there was lots of guys, when the lentil prices were like 40 cents, there was lentils grown all the way up North of Saskatoon, like up by PA (Prince Albert) and beautiful thick crop, disease, no pods, no yield. So there is, if you can develop I guess a more determinate variety that basically would say nope, I'm not growing any taller, I'm setting seed, maybe there'd be a fit more for the North, would be my guess […]."* (Professional agronomist H).

Another interviewee was trying to anticipate the future development of the pulse industry:

"[…] *Well, I don't think that the entire process is over yet, I think that there are more pulses in the works that are coming up and may become more, you know, predominant in the next few years as things progress as technology changes and as I guess markets change as well. So it's an ongoing process and lentil and pea is not the end of it, we're y'know we're seeing interest in faba beans and dry beans and other pulses so, so development is likely still going to happen and, we may see more changes yet compared to just lentil and pea* […]" (Professional agronomist I).

## 5.2 Saskatchewan Certified Seed Growers

### *5.2.1 Do you recall any specific people or conditions that influenced your decision to grow lentils? If not, very briefly, what motivated you to start growing lentils?*

The seven certified seed growers who were interested in talking to us were asked whether they can recall specific people or conditions that influenced their decision to grow lentils. If interviewees were not able to identify specific people or conditions, they were asked what motivated them to grow lentils. Four interviewees mentioned that Dr. Al. Slinkard was the key person who prompted them to grow

lentils. Respondents further explain that, at that point in time, they had various reasons to adopt lentils such as: '*the need for diversification, as cereals were not making money anymore*', '*crop rotation*', '*looking for something with a better value*', or '*looking for a new crop to increase profitability*', '*a few neighbours were doing it and they were having success*'. For other respondents, growing lentils is a family tradition, or it was triggered by the low wheat prices in the 1980's.

One quote stands out and perhaps explains why Dr. Slinkard had such an impact on so many of the growers; the respondent first explains that they were already growing peas in 1987, but after they attended one of Dr. Slinkard's presentation at the U of S, they became really interested in growing lentils.

"[…] *Al definitely influenced us, you know, he made us feel we can do that* […]."

### *5.2.2 In your opinion, what kind of institutional support was crucial for the development of lentil production in SK?*

Next, seed growers were asked what the crucial support for the development of lentil production in SK was. Most of the growers acknowledged CDC and SPG and their pulse breeding program as strong institutional support that would breed '*always better varieties*'. Further, SPG's manual for pulse growing has been an important source of information for seed growers. Another interviewee points out:

'[…] *Well, SPG was a major deal. I know back at the time, there wasn't a lot of support because they were still very new but most of us didn't, the only way we knew how to do them was through neighbours and you know starting to talk to people about starting to figure this out. But once it started growing, Sask Pulse Growers was a major factor for most people, a major source of information. Seed growers became a major source of information from their growing of them* […]".

### *5.2.3 Do you find it more difficult to grow lentils than other pulse crops? Have you tried to grow dry peas? If yes, which of the two crops is easier to grow? Why?*

For this question, most of the interviewees indicated that they find it more difficult to grow lentils than other pulse crops. Their reasons were mainly related to lentils' low height and its consequence on the agricultural machinery needed to harvest them. For example:

"[…] *So, lentils grow so close to the ground that when you wanna harvest them you have to shave the ground to get every single seed that you can get. So you have to buy specialty headers, you have to buy a different, you have to roll your land, you have to do everything you can to make it so you can harvest right on the dirt. And even in everything that you do you still end up pushing dirt through your combine, so you wear your machinery out a little bit more growing lentils than you do growing wheat and canola. All those extra things have always paid us back until the last couple years. But, it came at an extra cost*. […]" (Seed Grower A).

Or

"[…] *They either grow short or they don't stand up. We're in an abrasive median texture soil that's got stones in it. They are death on the combine. I don't know, as of right now, I'm growing them every second year, so I have to fix the combine every year. $10 000* […]" (Seed grower B).

In contrast, two growers had a different approach and opinions about growing lentils. One of them strongly advocates that with the current lentils' varieties available, along with the evolved agricultural technology, growers should not find lentils growing more difficult than other pulse crops:

"[…] *No, I think with today's technology now, you know, we've got, we've perfected the minimum till equipment now, so we can have a good field finish. We've perfected the distribution of straw and trash management off of the harvest period. We've developed rollers that level off the field, if you have any stones, we don't here in our heavy clay, but if you do have stones you can push the stones down so then it doesn't get in the way of harvest. We have come a long way from the original soy bean headers and swathers, to [inaudible] and flex headers that are 35 feet wide, so, with the right equipment and with today's technology, I would put it this way, it's been a convergence of variety development, herbicide development, machinery development, all converging at the same time* […]". (Seed Grower C).

The other grower describes new lentil varieties advantages:

"[…] *No, I wouldn't say that. It's a bit of a loaded question because most lentils are Clearfield now even though the highest demand we have for seeds is actually conventional. So we are growing mostly conventional lentils right now, but we have some Clearfield being grown for us because of course you know we have a broad spectrum of customers, but a Clearfield lentil is pretty easy to grow when you can spray, when you keep it clean by spraying a Sencor then a Solo, or something like that, where with conventional lentils, I'd say are more difficult to grow because it's hard to maintain a clean field, i.e., a higher yielding field with a conventional, but people are worried, you know, chemical group problems and that type of thing. So are lentils harder to grow than peas, it's a bit of a loaded question. A Clearfield lentil, no. But a conventional, maybe. [laughs]* […] (Seed Grower D).

### *5.2.4 Who do you talk to when you have questions about growing lentils? Do you find that you have access to the appropriate support or advice for growing lentils?*

As expected from the paper-based survey, few respondents indicated that growers talk to other growers, or to their neighbours. In a couple of instances, interviewees consider that they do not need help anymore for growing an already established crop.

Some growers indicate that they prefer to contact specialists for various lentils growing questions:

"[…] *I talked to SaskAg and Food. I talked to their specialist there. Specialists, so yeah those are the people we would contact - researchers and government agencies. Even Ag Canada, they have people who are disease specialists and things like that we can consult*."

At the opposite spectrum, one grower stated that:

"*Well, it's mostly personal experience and word of mouth. There are times you can learn things from researchers, but researchers aren't always out ahead of things. Sometimes farmers are ahead of the*

*researchers and because farmers got to stay in the game and we're, you know or time to do whatever we can to make our farm more profitable. We can't always wait for the research to be done*."

It is important to mention that a few growers acknowledged that when they have questions, they contact Dr. Bert Vandenberg and other plant breeders and researchers involved in pulse plant breeding at the U of S. The importance of growers having the opportunity to communicate, share information, find out the latest developments from the scientists involved in plant breeding is highlighted by the following quotes:

"[…] *I've had many direct conversations with Bert Vandenberg, like there's now we have much better and they are very willing to share which is awesome. It's a game changer being able to talk to the researchers. Talk to them about issues, talk to them about what type of things we might be looking. What kind of characteristics in these crops we might be looking for, it's been a real game changer […] We will go directly because we see them at our meetings, […] but as far as just growing the lentils, typically, we're quite comfortable with how to do it and you know wasn't a why and how to do this because we've done it for so long. But as seed grower, we are always looking for characteristics in the different crop types of lentils and we will talk directly to like Bert Vandenberg or funding men or whoever to try and find out some information cause we want to grow the next thing people are going to buy, we like knowing what they're thinking because we have to make a decision based on three years of replication before it's available. So, we do lean on the breeders heavily for that information. So, we go direct* […]" (Seed grower E).

The importance of communication between plant breeders and growers is very well articulated in the following quote:

"[…] *So, anyhow, that's a problem the lentil world has right now, and I've spoken with Bert and we've talked about it and there's no genetic solution, there's no solution to Aphanomyces root rot yet. And so that's a problem that we face most in, well pea and lentil world, where chickpeas and soy beans don't have that struggle* […] *there's some genetic material coming from France where they have some resistance to it, but it's a long process, so they're working on it but, there's no light at the end of the tunnel yet. From my perspective as a seed grower, and I get to see further ahead than Joe farmer does […]"* (Seed grower F).

### *5.2.5 Currently, in Alberta, the main pulse crop grown is the dry pea. Do you have any idea on why Alberta farmers prefer to grow dry peas, and not lentils?*

SK growers were invited to share their ideas on why AB growers prefer to grow dry peas. The majority of the answers converged on climate related reasons, particularly on the fact that peas perform better under moist conducive conditions which are specific to AB. The following quote sums up growers' reasoning: "[…] *Peas perform better under more moist conditions. Lentils you know, need a dry July. If you get a wet July, sometimes lentils, they just don't do very well, they get too much disease and they lodge and there's just a lot of problems with them. So lentils need a drier climate than field peas, so I think that's the reason* […]".

Another grower mentioned that most of lentil processing factories are in SK, and

"[…] *if you don't have processors then you're gonna have difficulty accessing markets for lentils* […]".

The most comprehensive answer belonged to one grower who mentioned numerous reasons why AB growers prefer to grow dry peas. His comment also summarized points made by other growers:

"[…] *quite possibly the biggest industry in Alberta isn't grain farm, it's cattle, right? And it's animals. And for the longest time peas paid […] as well as a feed stock. As a human consumption you know often there are feed peas and yellow peas are roughly the same price […] Lentils will only produce maybe half to two-thirds of what peas will produce as far as volume, and so why grow lentil that only produces half the volume as what peas do? […] peas are way easier to harvest than lentils. […] if peas don't fall down, which they've developed some really good varieties that don't, well they're easy to harvest, you're not cutting right on the ground, you're cutting three, four inches off the ground. […] For the longest time, you'll find this kind of funny, we have maybe a 25% to 33% of our farm in lentils, and when we were done combining lentils we felt like we were done combining. […] The stress is also there in lentils because they can lose their grade so quickly. So if you're growing green lentil and you lose your grade quickly, suddenly you had a crop that was worth a hundred thousand now worth 30, or yellow peas, they don't lose grade they can sit in the field forever, they're still yellow peas, you don't get damaged by weather at harvest time* […]."

### *5.2.6 Anything else to add?*

One of the seed growers took the opportunity to share their thoughts with us with regards to herbicide tolerant lentils:

"[…] *We've already taken care of some disease resistance and I'm talking not just lentils but peas. That's been looked after, yield's been looked after. The other kicker was herbicide tolerance. Peas have always had a certain amount because they're naturally intolerant. Lentils now have any tolerance, so that's one tool. In the next five years, we need a different herbicide tolerant system than lentils […]. Because we've got intolerant weeds […] You've got wild mustard. The guys down on the Regina plains, they can't kill the mustard with anything anymore because it's resistant. So they better start looking, especially in lentils* […]" (Seed grower F).

Another interviewee shared his vision regarding the pulse industry's future development:

*"[…] Well, I know the pulse industry has become a very, very large industry and I think up until recently we've been very export orientated, and […] of course the problem with that we're very vulnerable with […] some of these countries deciding they don't want to buy from us anymore. They're not going to buy from us to prop their own prices, and I think the more we can diversify the end use markets for these pulse crops, the better the industry will become. We also are a part of the pet food chain and have been for a very long time and I think it's been an awfully good thing for our industry because lower quality or even just slightly not to our better lentil, peas, chick peas used to have a dramatic hit, where now, you know the pet food industry has really levelled the playing food and given people a market for their not quite a better toured product that they just didn't have before. That's been one hugely awesome market for the pulse industry in Western Canada and now this pea protein thing and people eating more pulses in Canada, I think there are some really exciting things happening. […] So going forward I think that's going to be the key for sustainability is to continue to evolve our market and can we eat more. […] Anyway, there's my two cents worth, but I think it's extremely exciting market that we all participate in, but there is some risk* […]" (Seed grower G).

## 5.3 Alberta Professional Agronomist/Agrologist

The questions addressed to the ten professional agronomists from SK and AB were similar; as previously mentioned, the focus was switched from lentils to dry peas for AB agronomists.

### *5.3.1 How difficult do you consider dry peas growing compared to other pulse crops, for instance lentils? Why?*

Out of the ten interviewees, seven of them stated that dry peas are '*easier*' or '*much easier*' to grow than lentils, as seeding and harvesting dry pea present fewer complications, and dry peas are better adapted to the AB climate. They also mentioned that the accumulated experience in growing dry pea and existence of '*easily accessible markets*' are other factors that contribute to the willingness to grow dry pea. Further, agronomists explained that harvesting is easier with dry peas because of their height (and implicitly higher pods) and better standability in the field.

One agronomist considers dry pea to be the easiest pulse crop to grow compared to all pulse crops:

"[…] *Production systems are better understood. The equipment has been calibrated and set up to seed peas and it's not that the other crops are dissimilar. It's just standardized to the point that farmers just understand how to get the crop in the ground and get it up and going. How to manage it* […]."

Other interviewees considered that each crop has its own challenges, so they would not use the word '*difficult*' for any of them, but sometimes lentils may be seen by AB growers as a specialty crop, and thus, when growers have to choose between dry pea and lentils, they prefer to choose dry peas as there is more experience within the province.

One agronomist went to more detail to explain that lentils' indeterminate growth pattern and the black soil type creates additional issues when growing lentils in his region. He also explained the profitability difference between the two crops when they lose grade:

"[…] *The biggest problem we have here is our soil is pretty high natural fertility. We're mostly in the black soil zone for most of our area, so there is pretty high natural fertility there […] with relatively consistent moisture, we lentils tend to grow and grow and we get a lot of materials which has its disease issues, but we have disease issues with peas as well. But it's just far too vegetative here and for us to get a consistence performance out of them […] peas are easier from a point of view of marketing. We have a little bit more latitude in terms of grading compared to lentils as well […] lentils, you're talking about a number one or a number two and then it drops off. With peas, we are a little too far under the grade we can still market them. With lentils, you get an annual fall, we don't get favorable weather conditions, we get the mold and mildew and the staining on the lentils that would cause us to lose grade […] in peas, you got human consumption or you got feed peas. We haven't had too much of an issue with moving them. Okay, so if they aren't human consumption, so they aren't the highest grade, the highest price, you can still move them into feed peas and still make a reasonable return* […]."

### *5.3.2 What do you think motivates AB farmers to choose to grow dry peas instead of other pulse crops?*

Some respondents were quick to point out the available markets in AB for dry pea, where the well-established feed markets make producers feel they have a safety net in case climate contributes to seeds losing grade. They also acknowledged AB growers' experience (also defined as tradition), the crop rotation benefit, and as expected, the good price of dry peas which contributes to, at least, a steady return per acre.

As expected, many agronomists dwelled on the lentils' weeds issues in the moister AB climate:

"[…] *Early in the season you need really good weed control and that level of weed control has been around a lot longer in peas and in faba beans then it has been in lentils* […]".

One interviewee articulated in greater detail the difference in opportunities between the growers in the two provinces, in terms of growing dry peas because of the livestock industry, which is much more developed in AB, and in terms of not growing lentils because of not being aware of new lentil varieties with improved traits:

"[…] *Alberta has 40% of all cattle in all of Canada, so there's much more livestock in Alberta than Saskatchewan, so peas are also used for livestock feed, not just for the feed. […] Now, the thing with lentils is there's been two main issues that farmers won't grow lentils so much in Alberta, and one of them is due to indeterminate growth habit, and the other is due to the low hanging pods, and these were characteristic for the old lentil varieties like the Laird lentil that was common in the '80s and the '90s. So, farmers in Alberta got accustomed, they got turned off because of this indeterminate growth. […] they also have income from these other crops, they have canola and wheat that's easier to grow and the price of canola is always pretty high […], so they will opt to grow those and avoid crops like lentils. The other thing is many growers in Alberta have income from livestock as well, so that might be an impediment as well. They will not grow lentils as much, as slowing down at harvest is another factor. So even when faba bean was being tried and now they're looking at soybean, they would prefer those crops because they think they're much higher and faba is much higher, the pods are much higher, but we really need to do an extension to get the idea out there that these lentil crops are a lot easier to grow than they used to be* […]".

A couple of agronomists explained that, in particular in the Southern Alberta, where the lentils would be a good fit, many areas are irrigated, and farmers prefer to grow higher value crops:

"[…] *Partially economics and historical. You know, the growth to them, they're going to be looking at your irrigated crops that are potentially higher value. So if you look at lentil production, as I said in South Western Saskatchewan, parts of Manitoba into Northern Great Plains, it tends to be under dry land conditions, dryer soils and I think when you look at that challenge in Alberta because of the availability I should say of irrigation, they chose to grow higher value crops and not to say that lentils aren't a high value crop, but I think most people would find it easier to grow let's say canola under irrigation as opposed to growing lentils. […] with the availability of irrigation, people are looking at, as they say higher value crops, soft like leeks or potatoes […] if I were to put pivot irrigation into south western*

*Saskatchewan, I suspect that growers would start to change their growing practices to look at other crops that maybe, you know, more economically, I shouldn't say viable, but lucrative under irrigation and the fact that you know, lentils and peas under high moisture conditions are gonna suffer greater diseases and the issue of economic impact, that type of thing are gonna be more costly in that scenario* […]."

### *5.3.3 Do you find dry pea growers get in touch with you for information on dry pea growing more often than other pulse growers?*

The next interview question asked agronomists whether dry pea growers get in touch more often for information. The answers were quite concise even if divergent. Four of the interviewees stated that growers do not ask them questions, as peas have been around for a while, however, they have started receiving questions about faba beans:

"[…] *in recent years with faba beans, we probably got more specific questions and if you want to do it this way, look at the questions per acre certainly have more faba beans than you do on peas because it's just the unknown crop, people aren't used to growing it* […]".

A few agronomists said they definitely received more questions about the dry pea, as this is the largest grown crop in their area, with more questions about yellow than green peas. They mentioned that usually, growers ask:

"[…] *Everything from correct soil temperature to seeding to what sort of herbicides to use, when they're ready for pre-harvest or harvest […]. Just for a little bit professional advice or to get confirmation that what they're doing is correct* […]".

One agronomist stated that he does not receive many questions about dry peas, but for the past 8 years, he has been receiving more questions about lentils. His answer illustrates the impact of the climate and soil difference between the two provinces, but conveys his point of view on the necessity of developing research on lentil production in AB's climate and specific soil types:

"[…] *you're gonna probably laugh but lentil is a relatively new crop for Alberta* […] *a lot of interest but again, it was economically motivated and we, as Albertan, Alberta researchers playin' a bit of catch-up even though there's a huge body of research in Saskatchewan on red lentils and red lentil production, not all of that is easily transposable to Alberta conditions, especially when you get a little bit of more moisture. Deeper black soils, you know* […] *it's huge because with the moisture comes disease and, you know, one of the things that hit Alberta was the white mold or Sclerotinia of lentil and we had checked with our Saskatchewan counterparts they just said, "oh we just never spray for it they never need it, it's inconsequential." Well for us, not spraying, and we have good moisture and a little bit more fertile soil, that's devastating because you end up with this slimy un-harvestable mass and then that's just the whole story about well lentils are not adapted to a lot of Alberta […] it's a matter of learning how to grow that crop and we've had yields, you know, in higher moisture areas with better soil, 25 hundred to three-thousand pounds per acre. I think Saskatchewan average is what, 14-hundred, 16-hundred? So, they can be grown, but you gotta know under what conditions and you gotta know that sure as you put that seed in the ground you gotta spray for Sclerotinia that's not something you decide after you see it show up in the crop, it's a must-do* […]".

However, another interviewee talks about successful lentils research trials in East Central AB and brings up geographical explanations to explain the differences in adoption:

"[…] *There are some areas in Alberta that are well-suited for growing lentils, and I've seen a lot of lentils grow in east central Alberta in research trials and they tend to do well. I don't think the farmers have quite caught on to the idea that they could grow competitive lentils in their rotations in the same way that Saskatchewan growers have recognized that. But when you get a little bit, you got a lot of acres in central Saskatchewan, central and southern that are well suited for lentil production but when you get into to southern Alberta, you get into that Swift Current area of Saskatchewan, you get a lot of range, rolling hills, you know a lot of pasture range land. It's not suitable for crop production and when you get over a little bit further west into Alberta, you got irrigation and that's totally changes the makeup of the crop and lentils aren't a crop of choice in the irrigated areas. There are some areas in Southern Alberta where they could be adaptive, but I don't think the agronomic case has been made for lentils in Southern Alberta. We see some lentils creeping into south central Alberta but the soils are a little bit darker, the rain fall can be a little bit higher but there are some areas that are very dry so they are suited for I guess central eastern Alberta but there doesn't seem to be a lot of uptake. And a lot of that may just be extension agronomy. Maybe the farmers are just not as familiar with it […]".*

### *5.3.4 In your opinion, what kind of institutional support was crucial for the development of dry pea production in AB?*

Most of AB agronomists indicated that AB Pulse Growers and AB Agriculture had been an instrumental support since the establishment of the crop. Moreover, a majority of respondents indicated that the provincial government through its research and extension group was one of the main reasons why dry pea is such a well-adapted crop in AB.

Three interviewees have offered a surprising response, by associating the role of innovators to the concept of institution. All of them acknowledged the responsibilities undertaken by the innovators who first agreed to grow dry pea in their province, their willingness to take risks, and how innovators have been a crucial support in developing the dry pea industry in AB:

"[…] *Alberta agriculture researchers that were persistent and said, "Hey this is a crop that's different now. It has these tendrils that replace the leaf they actually, you know, when you have the right plant stands, the right harvest equipment, they actually can stand, and they yield quite well. […] but there was some persistent, you know, very innovative farmers in Alberta that thought, 'ya know, we could grow this crop,' and when they start bangin' out these higher yields and getting this rotational effect where you know on dry pea fields, pea stubble, the following crop year, you're getting non-wheat, you can get a 10 to 20% yield increase, and a 1% increase in actual protein […] it started as a feed crop but now it's 99.9% of it is human consumption* […]" (Professional agronomist J).

And:

"[…] *I can only speak for our area. I think probably the key, biggest motivator, I would call them growers that were innovators. So I think a lot of us would like to take credit for making it happen but realistically it was the innovative growers that started the whole thing. There were some growers here that spent some time in Manitoba, little bit in Saskatchewan, started working with some breeding companies,*

*brought in some genetic material from Europe, started playing with it further. And the rest of us kind of just jumped on board at the early adoption stage and helped gain the crop some early attraction. Once growers had some pretty good success, whether it's me or whether the grower, any of us that are early adopter, I consider myself an early adopter, I am not a farmer but when I see something working, I will jump on board with it. It's the same with growers* […] (Professional agronomist K)."

The importance of 'innovators' in adopting new crops was explained as:

"[…] *And most of us will not choose to try something unproven unless you're, you know, that small percent of the population that's a thrill seeker - always looking for something new and different. Sort of the bleeding end of technology and with farming too, if you look at it as far as returns versus investment, it's extremely expensive business to be in, with huge amounts of money invested in land and equipment. And then something new usually you leave it up to crazy guy to try it and the neighbours, right? It's just extension theory that there's always gonna be that one three or five percent at the top that'll try new stuff and they can possibly afford to make those changes. And so they're the ones that'll try first and if it's proven, then you start getting that localized adoption of it* […]" (Professional agronomist L)."

### *5.3.5 Currently, in Saskatchewan, the main pulse crop grown is lentils. Do you have any idea on why SK farmers prefer to grow lentils?*

A majority of interviewees believe that SK farmers prefer to grow lentils because of the drier climate, the profitability of the crop and the lack of alternatives in SK compared to AB. Apparently, in the early 1990's AB provincial government was offering numerous funding programs to provide income support for agricultural producers for growing various crops:

"[…] *I tend to think that that's probably linked somewhat to the government funding programs we had back in the late 80's, early 90's. 'Cause we had, back in those days when there was, farming was tough. Alberta government had a lot of programs. In fact, it was like 14, 15 different programs where you could get money from the government, so it did enforce us to adapt and change or try something new in desperation, whereas Saskatchewan didn't have that particular government involvement and they were forced to adapt and find something new and economical* […]."

Another grower considered pointed out the soil type differences between the two provinces and the irrigation advantages:

"[…] *it's very simple. It's, farmers in Saskatchewan are really, really, in tough economic times and were absolutely desperate and had to do it, whereas I think Alberta farmers were more prosperous. You know, we have more moisture, you know, have better soils in a lot parts of the province, you know we have irrigation, million acres of irrigation in the south-end parts* […]."

Many of the respondents have mentioned Dr. Al Slinkard's instrumental support for lentil development in SK, support that continues through Dr. Bert Vandenberg and the entire pulse breeding team:

"[…] *Like Al Slinkard was instrumental in establishing that whole market and getting the adaptation going […] and Bert Vandenberg was another one and you've got really strong pulse people* […] (Professional agronomist M)."

Or

"[…] *I've always heard that there was a lot more push in agronomic support for getting lentils adopted and convincing growers that it was worth doing, so I think Bert Vandenberg for sure and other champions, I don't think you can underestimate this one* […] (Professional agronomist N)."

However, even though one of the agronomists acknowledged Dr. Slinkard's impact on lentils adoption is SK, still cannot entirely explain the 'invisible border' phenomenon between AB and SK with regards to lentil growing:

*"[…] Al Slinkard did an awful lot of work to develop that market […] He was a breeder, a researcher, he brought the lentil crop to Saskatchewan, showed people how to grow it, that it could be profitable and it took off and that was again a translation of the release of the research work in the extension and the growers grabbing on to the idea that there's good money to be made in lentils and I just think there's been more of a concerted effort to develop lentil market in Saskatchewan than there has been in Alberta, for whatever reason. Maybe as I said earlier, historical for the Albertan growers, just lentils, haven't had the promotion they've had in Saskatchewan, and there wasn't a reason for that because the line at the border between Saskatchewan and Alberta, there's no reason that they can't grow lentils in Alberta other than I think the efforts been greater into Saskatchewan than in Alberta. […] if you look at the history of lentil production and development in Saskatchewan, that's where it was when Al Slinkard and obviously Bert's been involved and other people, but when Al moved out of the US to Saskatchewan and started the lentils and that whole program of pulse crops and the things that Bert's been involved with breeding* […]" (Professional agronomist O)."

### *5.3.6 Anything else to add?*

At the end of the interview, a few of the AB professional agronomists shared with us their final thoughts on the crucial impact of the institutions that contributed to lentil adoption in SK:

"[…] *I just think that Saskatchewan had... Say call it an advantage or disadvantage and it's pushed them to actually expand the envelope of crop reduction faster than Alberta. And I mean look at what we have right now for resources. To do pulses in this province, we don't have a lot. I don't know of anybody who teaches at the U of A that specializes in pulses […] So that being said, we rely on Saskatchewan* […]" (Professional agronomist P)."

or shared their opinion on how lentil adoption in AB should be planned:

"[…] *I think the ones that came up and saw the trials were looking at it and said yes the experts, the government is doing research trials and they look really good but you have […] one provincial pulse specialist doing a couple of trials a year and you have a tour and 30 farmers will come in and look at it, so that's really not going to drive that penetration of lentils where it might be suitable. You are going to have to set up a really solid agronomy program that ties the seed distribution network and the seed sellers into an agronomic network and you are going to have put in the Alberta Pulse Growers and really develop a concerted effort to teaching the farmers that, I guess watching the farmers how to grow lentils for the ones that aren't growing them and you are going to have to build a comfort. So, there is going to have to be a lot of outreach over the winter. There is going to have to be a number of demonstration trials over the summer over a larger area and I don't know how is going to do it and I don't know who is*

*going to pay for it but that's what needs to be done […] and that effort is going to have to be driven by someone […]* (Professional agronomist Q)."

## 5.4 Alberta Certified Seed Growers

### *5.4.1 Do you recall any specific people or conditions that influenced your decision to grow dry peas? If not, very briefly, what motivated you to start growing dry peas?*

The first interview question asked AB seed growers what influenced their decision to grow dry peas. Out of the seven interviewees, most of them very briefly referred to the crop rotation needs, family traditions, and potential return. A couple of respondents indicated they wanted to try something new or to switch away from dry beans.

### *5.4.2 In your opinion, what kind of institutional support was crucial for the development of dry pea production in AB?*

For the second question, interviewees stated that the main support for the development of dry peas in AB was mainly provided by Alberta Agriculture, Alberta Pulse Growers, private agronomists, contracting companies or even buyers who provided agronomic support and marketing information.

AB Pulse Growers assistance and Alberta Agriculture were seen as instrumental for the development of dry pea production by most of the respondents. A few respondents expressed their regret that AB extension support has been discontinued and they have to rely on private agronomists. Other sources of institutional support mentioned by interviewees were the U of S CDC, Agriculture and Agri-Food Canada and research stations in AB, such as Lacombe and Lethbridge.

"[…] *There's, I really don't know how it works in Saskatchewan but in Alberta that's pretty big business. Alberta Agriculture used to have agronomists and a hot line you could call for support. They may still have a hotline but the whole industry has basically shirted to private agronomy so a lot of people that were working in the public sector have migrated into the private sector. Have their own agronomy services or working for larger companies like Cargill some of these other companies. An off shoot of that would be the agronomy services, so it's kind of migrated from public to private in that aspect* […]".

### *5.4.3 Do you find it more difficult to grow dry pea than other pulse crops? Have you tried to grow lentils? If yes, which of the two crops is easier to grow? Why?*

When asked whether they find it more difficult to grow dry peas compared to other pulse crops, respondents consented that dry peas are '*easier*', '*slightly easier*' or '*easiest*' to grow compared to lentils or any other pulse crop. They specially noted their experience of growing dry peas, the lack of marketing opportunities for faba bean, the easiness of harvesting dry peas compared to lentils:

"[…] *I plant them. You don't need really much fertilizer as well. Just a little bit of phos. You can straight seed them and just spray them once and maybe a fungicide and desiccate and combine. It's a fairly easy crop to grow. They stay standing nowadays and they yield very well […] under irrigation, this is strictly under irrigation anyway. There is more of a yield advantage to peas than lentils. Lentils it is, you can get*

*a little bit of yield advantage over dry land. Guaranteed 40, 50 bushels, but dry peas you can get up to 90-some bushels* […]".

### *5.4.4 Who do you talk to when you have questions about growing dry peas? Do you find that you have access to the appropriate support or advice for growing dry peas?*

Most respondents stated that they have appropriate support or advice for growing peas. Certified seed growers usually ask for advice from staff or attend events organized by Alberta Agriculture, Alberta Pulse Growers, and Agriculture Canada. Almost all of them have mentioned consulting with local representatives of companies that sell herbicides or fungicides. Most of the interviewees admitted their interest in attending customer meetings organized by various companies, where crop specialists or entomologists are invited.

"[…] *The only advice that we usually get, is like we have some insects that, lentils and peas are, grasshoppers are really hard on lentils and on peas. We have the pea leaf lentil so sometimes we will talk to some of the researchers around that are dealing with this, the insects* […]."

However, regarding regular dry pea production activities and agronomics, respondents rely mostly on private agronomists. Further, a couple of interviewees prefer to consult with their neighbours or see themselves in the position of offering advice to others.

Also, the discontent of not having provincial agronomists to support pulse production was reiterated for this question:

*"[…] I don't know of any farmers that are operating without the assistance like having a private agronomist on the payroll of some sort. They would take, usually the way it works, they would take some acres. I farm around 5000 acres. I might give like 1000 acres or 1500 acres to one private agronomist and some to another and I'll just keep some of the acres on my own so I can reduce the cost because it's usually a per acre cost for advice on those acres. And then whatever crop I grow on those acres, I'm paying a fee to the agronomists* […]."

Few of them reach out for advice on growing dry pea from Saskatchewan:

"[…] *In this field you absorb so many things that they come together as one conclusion, but it can be coming from three four five different sources right. I look around a lot, I talk to my fellow farmers or to your people in Saskatchewan, friends. I have discussed many things with Bert or with the team that he works for, so, it's many avenues that feed into the same direction* […]".

Some of the AB research stations (Lacombe and Lethbridge mostly) and their staff seem to play an important role, as they were mentioned by few respondents, for example:

"[…] *my go-to person was, her name was Dr. Samaya Chatterton at the Lethbridge Research Station. […] And then we use our agronomist right like, y'know like, the different retail outlets here like whether it be Nutrien Ag Solutions or Richardson Pioneer, or the Co-op or doesn't matter who, like they've all got agronomist on staff, right. So, then we'll rely on them any time we have other questions* […]."

However, a couple of respondents indicated that they feel like not being able to access enough information about lentils as they just started growing lentils in an area in AB where other farmers grow only dry peas.

"[…] *Dried peas, there is an abundance of information because there is a lot in our area. Lentils, I think it's more just not knowing who the best contacts are as of yet. […] we tried to get as much information as we can. It's just less information because we are in a non-traditional area* […] *maybe it's just me not knowing who to contact in some of these areas. But the people I've talked to have been great help. I certainly don't want to come across as I'm not getting any help. […] I would say there is decent institutional* […]."

### *5.4.5 Currently, in Saskatchewan, the main pulse crop grown is lentils. Do you have any idea on why SK farmers prefer to grow lentils?*

The majority of AB seed growers opined that SK farmers prefer to grow lentils due to conducive climate for lentil production, particularly the higher number of heat units per year, and the reduced moisture that SK gets compared to AB.

"[…] *We don't have the heat units that some areas of Saskatchewan do, so if you get right into Southeast corner Alberta, that's where a lot of the chickpeas, and lentils, and peas are grown which is similar to the Saskatchewan climate and they don't have any misses. We are growing chickpeas in our area and I had to get rid of my chickpeas because they just wouldn't ripen. Not enough heat units* […]".

A couple of respondents asserted that the market demand for lentils influences SK farmers to grow lentils. Further, most of interviewees' opinions revolved around the idea that SK farmers grow lentils because of their higher price, and implicitly higher return per acre:

"[…] *Probably because they think to give a little bit higher return at certain times. In my opinion it's more of a gamble crop than peas, where you can get very high price if the scenario's right for you. So, some Saskatchewan farmers are gamblers. It also may suit a little bit with your drier climate. Lentils don't like wet conditions before harvest. They keep going then they need the dry weather to shut down and to ripen. So, with that you might have the better scenario for getting good quality* […]."

Some respondents answered this question by comparing and contrasting opportunities, or their lack of, between AB and SK, particularly when referring to the well-developed AB cattle industry:

"[…] *We have a really big beef livestock industry here and feed prices are always very high in this area. They are the highest in Canada and the further away you get from this area, the feed values start to drop, so peas and lentils become more attractive rather than just growing barely or buckwheat or somethings like that. Peas are not as easy as they need to grow. If you are in a big feed area, or feed barley to grow, then the prices are higher. Sometimes it's just easier to do that instead of growing peas or lentils* […]."

### *5.3.6 Anything else to add?*

Two of the certified seed growers interviewed were willing to share their thoughts with us at the end of the interviews.

One of them revealed his/her views on the 1991 AB Gross Revenue Insurance Program (GRIP), a provincial government program designed to encourage lentil growing (among other crops) one that they

believed it failed to achieve its goal with respect to increasing lentil growing in the province, for the following reasons:

"[…] *in the late '80's or early '90's there was a crop and friends program for couple years called GRIP, Gross Revenue Insurance Program and the first year of that GRIP program, if you grew lentils it would look out, depends, the coverage for lentils was really high under that program. I think that year there was 150,000 acres of lentils growing in Alberta, which is probably like 100 times the acres that have ever been built. So, there was a huge number of people who grew lentils all over Alberta because it became easy in the GRIP program. But most of these lentils were grown in areas that weren't really suitable for lentil production and they're all grown by new growers who in some cases, you know, didn't do their homework or some of the correction practices right. Most of the of 150 000 acres of lentils that went in that year, had you know really dismal return, so most of those people, most of their neighbors, never got back in lentils or never tried it again because they remember how bad it was at that time of year* […]".

The second seed grower presented his view on the differential access to pulse varieties between Saskatchewan and Alberta:

"[..] *now what was happening was that the Pulse Association in Saskatchewan I believe it is called and the Pulse Commission in Alberta made an agreement some years ago that they said, okay we will pull together and produce in Alberta can get Saskatchewan varieties and vice versa, produce from Saskatchewan can get varieties bred in Alberta this is bred varieties in Alberta or Saskatchewan. […] later pulse groups agreed to not agree and split ways so Alberta said, well you know what we cannot support your program any longer, they put pits of money at the time into the Saskatchewan breeding program and for that got rights to the Saskatchewan variety. After they did this [inaudible] anymore, they didn't pay them money anymore, then of course Saskatchewan said: well then you locked out, your farmers are locked out, Alberta farmers are locked out to get Saskatchewan varieties. So that's why we have the problem of not being able to get Saskatchewan varieties. Unless an Alberta farmer has a farm in Saskatchewan and is both a Saskatchewan grower and Alberta grower, which are very few. […] We seem to divide always. Rather than combine. And we go to other ones saying nobody likes us* […]."

# 6. Discussion of findings

This research sought to explore the various factors that influence producer decision-making processes and that contribute to an effective communication and knowledge exchange, with the aim of optimizing farmer adoption of new lentil varieties. Further, this research focused on identifying the reasons behind the uneven pulse adoption in Western Canada, particularly in Saskatchewan (SK) and Alberta (AB). We designed a semi-structured interview, carried out by phone, directed to certified seed growers and professional agronomists from SK and AB, focused on lentils and dry peas, respectively. To develop the interview questions, we used the quantitative results of our previous paper-based survey addressed to SK lentil growers.

Briefly reviewing SK interviewees' reasoning and behaviour with regards to the difficulties of lentil growing compared to dry peas, professional agronomists' opinions coincided with SK seed growers' views about lentils' low height and the damage caused to agricultural machinery during harvest, as well as lentils' critical disease issues. However, it was interesting that few growers, and no professional agronomists, pointed out that with the current lentil varieties available and the evolved agricultural

technology, it should not be more difficult to grow lentils than other pulse crop (i.e.: drought tolerance, canopy density explanations).

The quantitative findings of the paper-based survey validated the interview findings on why SK growers prefer to grow lentils. As expected, agronomists and seed growers pointed to lentil prices, better climate conditions for growing lentils in SK and farmers' tradition and experience. However, the interviews mentioned Dr. Slinkard as crucial support in the past, and the current plant breeding team as crucial current support. When asked why AB growers prefer to grow dry pea and not lentils, we learned that in addition to physiological differences between the two plants and climates, interviewees noted the positive financial impact of the AB oil industry in the overall province economy, as well as on the existence of a strong demand for dry pea from the cattle feed industry.

SK growers noted that when they have questions about lentil growing, they contact Dr. Bert Vandenberg and the other plant breeders and researchers involved in pulse breeding at the U of S, illustrating the importance of frequent and open communication between plant breeders, researchers and growers, as well as growers' desire to learn about and understand the most recent pulse breeding solutions or challenges. Both agronomists and growers were willing to share with us their needs and experience and were hopeful that their message would get through us to the breeders. For instance, interviewees explained in detail why there is a need for improved herbicides options for lentils or for new lentils varieties that are herbicide tolerant. Another interviewee shared his views on diversifying the uses of pulses in human consumption in the future, so that overall pulse demand would further increase.

Both categories of interviewees from AB consider that dry pea growing in AB is easier than lentil growing. They acknowledged the same reasons as their SK counterparts: climate, tradition, experience, and dry pea's physiological advantages over lentils. They also noted the importance of AB feed markets and their steady demand as a strong motivation for choosing dry pea over lentils. A few of the interviewees explained that southern AB, which has very similar growing conditions for lentils with SK, is mainly irrigated and growers prefer to grow higher value crops than lentils.

Besides acknowledging AB Agriculture and Alberta Pulse Growers, a few AB agronomists see farmer innovators as a crucial institutional support in developing the dry pea industry in AB. Agronomists asserted that SK farmers prefer to grow lentils because of Dr. Slinkard's instrumental support which has been continued through present pulse breeders' team at the U of S. One AB agronomist detailed how he envisioned a successful lentil adoption campaign in AB similar to the one in SK.

AB growers expressed regret that provincial extension support has been discontinued and they have to rely on private agronomists for all regular dry pea production activities and agronomics. A couple of growers indicated that they are not able to access enough information about lentils as they just started growing lentils in an area in AB where other farmers grow only dry peas.

Interviewees from both provinces provided their opinion on factors that may have contributed to diverged lentil adoption. Besides the climate and geographical differences, tradition and experience, they specified factors such as the presence of irrigation in the southern part of AB, the steady feed market demand for dry pea in AB, the implicit financial impact of the oil industry in the province, and the zero tillage uptake in a greater percentage in SK. AB interviewees also asserted adoption has lagged due to lack of information on lentil growing in areas where most farmers grow dry pea or other crops,

not having enough extension support, or not having access to new pulse varieties to the same extent as SK farmers.

One final result of our investigation was a list of breeding priorities. SK agronomists expressed interest in breeding herbicide tolerance, obtaining a more determinate growth pattern, improving plant's height and standability issues, and reducing canopy density.

AB agronomists added the need for developing lentils varieties that are better suited to more moisture and to different soil types. AB agronomists also expressed their opinion that more agronomic extension is needed in AB on lentils adoption. Ultimately, most respondents recognized the importance of information, extension, and training. In particular, AB agronomists noted the crucial role of innovators and leading farmers who may, through their example '*pave the way perhaps to success'*.

# 7. References


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