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AGILE – Lentil Growers Survey Results

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This research is undertaken in collaboration with the Johnson Shoyama Centre for the Study of Science and Innovation Policy.

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Introduction

Pulse adoption in Western Canada has known an uneven uptake and it cannot be attributed to only agronomic conditions, as pulse adoption levels vary substantially across soil zones in Saskatchewan, Alberta and Manitoba (Nakuja, 2016). Understanding the adaption and adoption of new lentil varieties at the farm level addresses an information gap with regards to optimally exploring the benefits of lentil production.

Objectives

The main goal of carrying out this survey was to better understand how and why growers adopt new lentil varieties, by uncovering the institutional, community and personal characteristics and processes that facilitate uptake and use of new crop varieties. The study had two main hypotheses. The first one is that farmers are subject to a set of cognitive biases and heuristics that may lead to sub-optimal decision making. The second hypothesis assumed that farmers do not take decisions in isolation as belongingness to communities and networks influence their perceptions and evaluations.

Methodology

The survey was filled by a total of 141 respondents between January and April 2018. The survey contained 25 questions ranging from open-ended, Likert scale or ranking type of questions. As respondents did not answer various questions throughout the survey, the number of respondents (*n*) reported for each question varies.

Major findings of the survey:

- All 141 farmers who participated in the survey have been growing lentils in the past five years and are involved in farm-level related decision making. Survey participants can be generally portrayed as mostly Saskatchewan farmers (98%), males (86%), highly educated (87%), with an age range almost equally distributed for the 30-54 (45.6%) and more than 55 years of age (40.6%). Respondents grow pulses and lentils on plots of land less than 2,000 acres and most of them have a significant experience farming, growing lentils and growing pulses, on average of 28, 15.4 and 15 years, respectively.
- Respondents identified the first three reasons for growing lentils as ‘crop rotation’, ‘profitability’ and ‘returns on investment’.
- 29% of respondents do not use social media, however, the majority of users have accounts on Facebook (60.5%) and Twitter (52.4%).
- As expected, lentil growers give advice to family, friends and acquaintances; however, farmers feel comfortable giving frequent advice to professional agronomists and producers associations

- The top 5 most trusted sources of information with regards to lentil production in general are professional agronomists, producers associations, friends, university sources and seed growers.[1]
- The top 5 most trusted people or institutions whose advice influenced growers the most with regards to which new lentil variety to actually grow are professional agronomists, producers associations, government sources, friends and family[2].
- Preferred sources of information about new lentil varieties vary depending on the institution that is releasing it. For instance, for producers associations, university, and government sources growers prefer mainly their own internet research as well as posters, pamphlets and printed materials.
- An overwhelming 80% of lentil growers prefer to learn about new lentil varieties advantages and challenges from 'producers association', followed by 'seed growers' (64.5%), and 'friends' (62.4%).
- The decision to cultivate a new lentil variety is 'always' and 'frequently' influenced by yield, disease resistance, the Seed Guide and herbicide resistance.
- The majority of respondents refrained from answering the questions regarding belongingness to a formal or informal network.

Conclusions

The results of this lentil growers' survey indicates that famers make informed choices, and the reasoning behind choosing lentils is driven mainly by crop rotation needs. The financial remuneration plays an important role, however, financial-related terms are ranked below reasons such as 'agronomics', 'nitrogen fixation' or 'soil benefits'. Further, an interesting finding is that communication with institutions about lentil cultivation is not unidirectional. In other words, lentil growers feel comfortable to frequently provide feedback and advice not only to family and friends, but also to professional agronomists and producers associations. As expected, the majority of growers choose face to face communication about lentils with family, friends and acquaintances. However, text messages and phone calls are also a favored means of information exchange.

The first part of the survey contained questions about lentil production in general, which implicitly suggested that the questions refer to existing lentil varieties. To assess whether there is a different attitude and/or choices about new lentil varieties, the second part of the survey contained questions particularly directed to new lentil varieties. These questions were slightly different than in the first part, however, they had the same focus on communication, trust, sources and channels of information. For instance, an interesting result with regards to general information about new lentil varieties is that

[1] Between 45% and 75% of all survey participants ranked these options from 1 to 5 only. Thus, caution should be used when interpreting these results.

[2] Same as above

growers prefer to browse information posted on university, producers associations and government websites. Posters, pamphlets and printed materials are actively sought by respondents when they are published by producers associations, seed growers, university and government.

With the aim of investigating growers' preferences for certain lentil varieties and attitudes towards innovation in general, respondents were asked how many lentil varieties, both regular market class and niche varieties, they had considered planting in the past five years, how many they had trialed in the past five years and how many they actually planted for more than one year. Most survey participants stated that they trial and grow regular market lentil varieties. For both regular market and niche varieties, most of respondents considered, trialed and planted mainly 1 or 2 varieties. Even if more varieties were considered in the past five years, only a few respondents trialed or planted 3 or more varieties. Thus, the survey participants seem to have a bit of a conservative approach with regards to adopting more, and perhaps newer, lentil varieties.

Summarizing the above, the main message conveyed by the responses with regards to both existing or new lentil varieties, irrespective of the type of information they accessed (general information on lentil production or challenges and advantages), lentil growers trust and prefer to receive information mainly from producers association, professional agronomists, seed growers and university sources.

Regarding a future examination of the lentil growers' interactions and decision making processes, the unexpected lack of responses hindered our intention of identifying farmers' formal and informal networks and perform the ego-centric analysis that we intended to. However, in the light of these results, it seems reasonable that the investigation to uncover the lentils' pathways of adoption to be directed to key people from producers associations, agronomists and seed growers from SK and AB. This may shed light on the difference in lentil adoption in the two provinces and highlight the importance of key players at an institutional level.

1. Introduction

Pulses play an important role in crop rotations in Western Canada, offering a profitable crop that helps to conserve nitrogen in multi-year crop rotations. In addition, pulses developed and produced in Western Canada are key to meeting the growing food and nutritional security demands in the next decades. Pulse adoption in Western Canada has known an uneven uptake (Statistics Canada, 2014) which cannot be solely attributed to only agronomic conditions, as pulse adoption levels vary substantially across soil zones in Saskatchewan, Alberta and Manitoba (Nakuja, 2016). Understanding the adaption and adoption of new lentil varieties at the farm level addresses an information gap with regards to optimally exploring the benefits of lentil production.

2. Objectives

The main goal of carrying out this survey was to better understand how and why growers adopt new lentil varieties, by uncovering the institutional, community and personal characteristics and processes that facilitate uptake and use of new crop varieties. The first theoretical hypothesis of this study is that farmers are subject to a set of cognitive biases and heuristics that may lead to sub-optimal decision making. Hence, many of survey questions were open-ended, allowing participants to indicate the reason for taking certain decisions. The second hypothesis is that farmers do not take decisions in isolation as belongingness to communities and networks influence their perceptions and evaluations. Thus, the survey contained questions designed to help us identify and map farmers' formal or informal networks.

3. Methodology

The present survey was approved by the U of S Behavioural Ethics Board (Beh 17-448) in January 2018 to be carried out as a paper-based survey. Thus, questionnaires were first distributed during Crop Production Week (January 5th to 11th), to CropSphere participants, in Saskatoon. Each survey had attached a consent form that informed respondents that participation in the survey is voluntary, and that they can choose to not answer questions with which they feel uncomfortable. Respondents were also informed that they will receive a $5 dollar Tim Horton's card for taking the time to complete the survey.

The survey was filled out by 61 respondents during CropSphere. Paper-based surveys were later distributed during Saskatchewan Pulse Growers Regional meetings (February 5th to 8th) in Rosetown (25 completed surveys) and Swift Current (53 completed surveys). The total number of responses was 139.

The survey was then uploaded online on Survey Monkey platform, and a new application was sent to University of Saskatchewan Ethics Office for approval of the online version. However, it was not possible to reward online respondents with digital $5 Tim Horton's cards, as Tim Horton's only sells digital gift cards in denominations of $10 and above. Only 2 growers completed the online survey, and thus, the total number of completed paper-based and online surveys was 141. Respondents did not answer various questions throughout the survey, thus, the number of respondents (*n*) is variable and it is reported for each question throughout this report in the associated text, table or figure.

The survey contained a total of 25 questions, ranging from open-ended type to Likert scale or ranking type of questions. The questions covered demographics, land ownership and land use, farming experience, social media use, reasons for growing lentils, farmers' communication channels, most trusted sources of information, communication frequency with identified sources for both new and existing lentil varieties, assessing lentil cultivars' performance, formal and informal networks and type of information exchanged in these networks.

The first two questions were self-eliminatory, asking respondents whether they are involved in farm-level decision making and whether they had grown lentils within the past 5 years (since 2012), respectively. Respondents were informed that if their answer was No to any of these two questions, they should stop filling out the questionnaire.

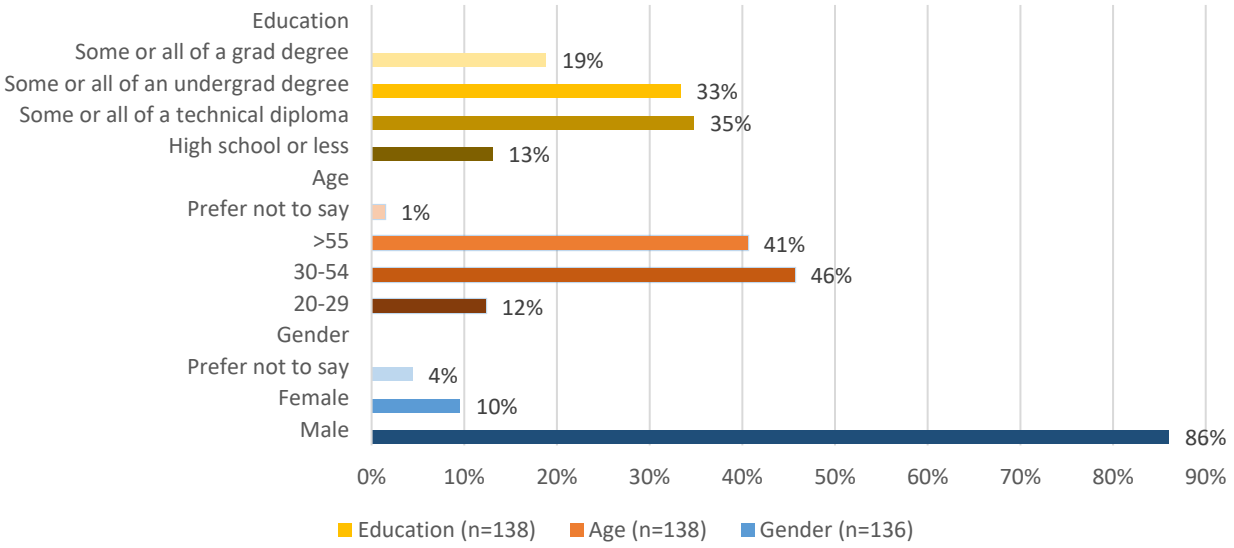
4. Demographics and respondents overview

Figure 1 illustrates that respondents were predominantly males, accounting for 86% of the respondents' pool, while only 9.6% were females. Of the 136 respondents to this question, 4.4% preferred not to identify to a gender. Comparing these results to the 2016 Census of Agriculture for Saskatchewan in terms of gender, females are underrepresented in our survey as the Census reported that in 2016 female farm operators represented a quarter of all farm operators (Statistics Canada, 2017 [1]).

Less than half of the respondents (45.6%) are in the age range of 30 to 54, 40.6% are over 55 years old, while only 12.3% are under 30 years of age. Out of the 138 respondents to this question, two (1.4%) chose not to disclose their age. By comparison, in the 2016 Census of Agriculture (Statistics Canada, 2017 [1]), 55.9% of all farm operators in Saskatchewan are 55 years of age or older, 34% are between 35 and 54 year old, and 9.7% are under 34 years of age. Hence, our survey participants are younger than the Saskatchewan farm operators.

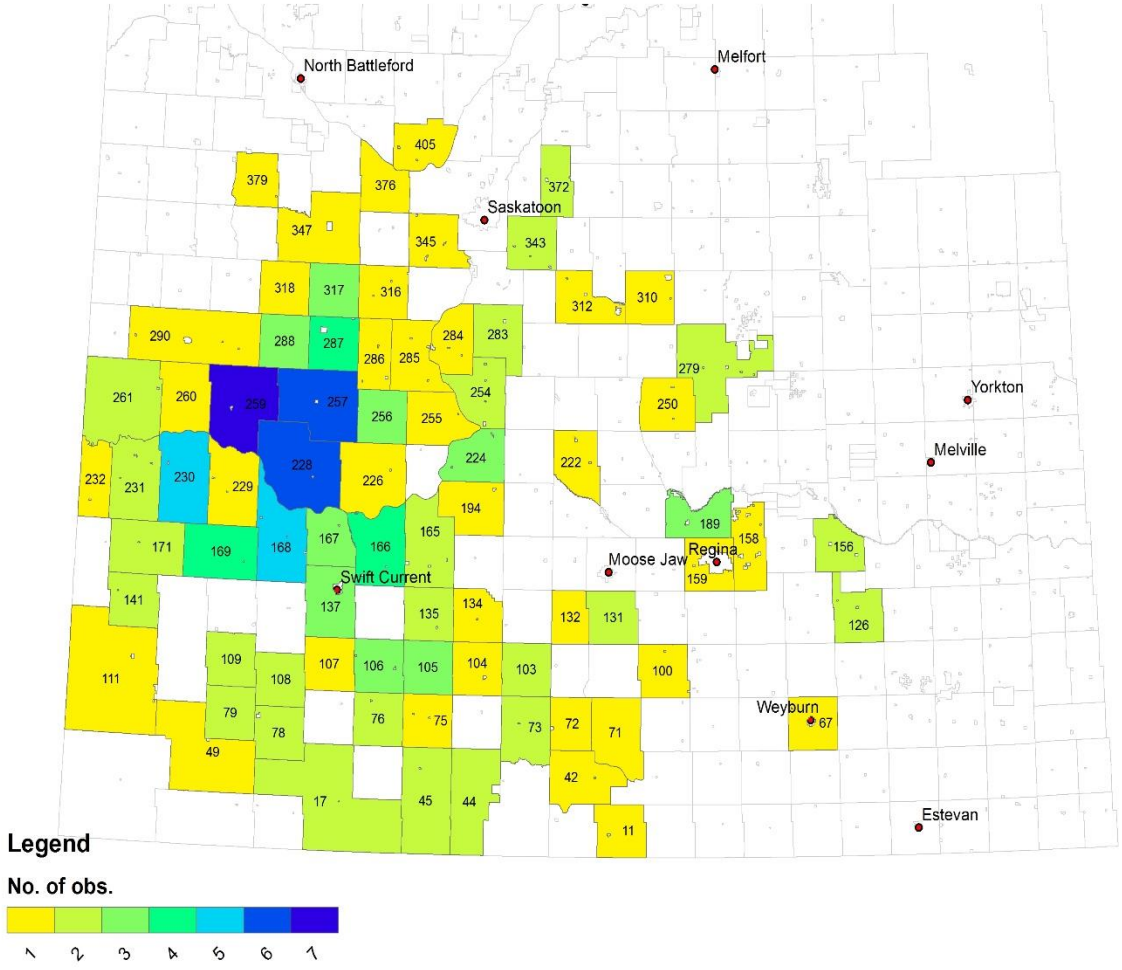
More than one third (35%) of the 138 respondents have some or all of a technical diploma, including and apprenticed trade, another third (33%) have some or all of an undergraduate degree, 19% have some or all of a graduate degree, while 13% have finished high school or less. Census data (Statistics Canada, 2017 [2]) show that at a provincial level 53.3% of farm operators have finished high school or less, 30% have a non-university certificate diploma (including apprenticeship or trade certificates) and 16.7% have some or all of an undergraduate degree and some or all of a graduate degree. Thus, our survey participants have a higher education than the provincial average.

Figure 1. Survey participants' demographics



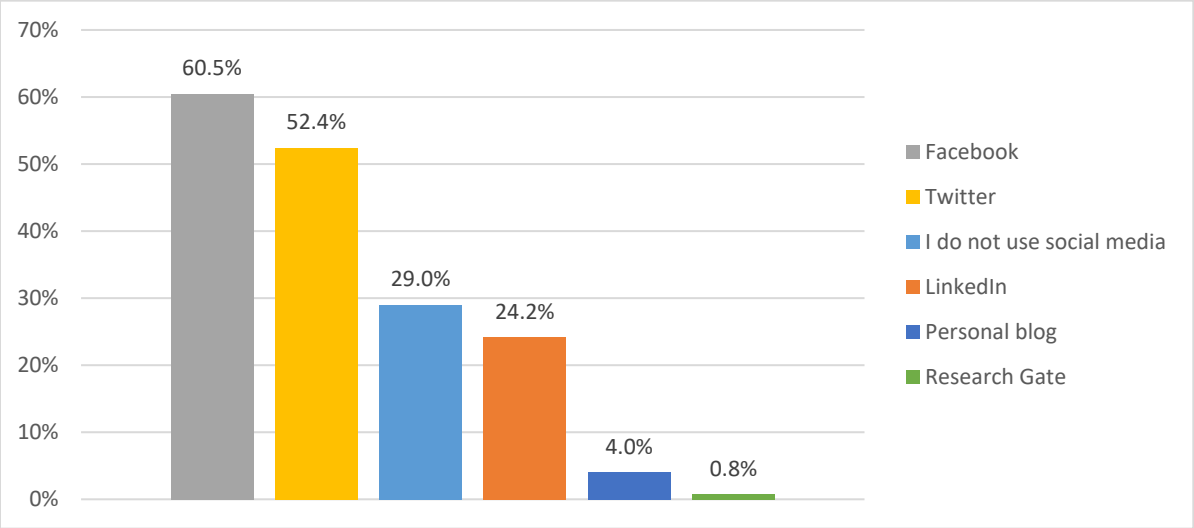
The next question inquired respondents what province they farm in. Most of the respondents to this question indicate that they farm in Saskatchewan (98.6%) and only couple of them (1.4%) in Alberta. Further, survey participants were asked to share with us their rural municipality (RM) number or the municipal district name. 136 growers answered this question. Except for 2 growers from Alberta, 134 lentil growers farm in Saskatchewan. On Figure 2, dark blue indicates that 7 respondents farm in RM 259, while blue indicates that 6 respondents farm in each RM: 257 and 228, respectively. The concentration of respondents seems to be in the Rosetown – Kindersley – Swift Current. This can be explained by the fact that more than half of the surveys were filled out during Saskatchewan Pulse Growers Regional meetings that took place in Swift Current and Rosetown.

Figure 2. Survey respondents' geographical distribution based on the Rural Municipality (RM) number



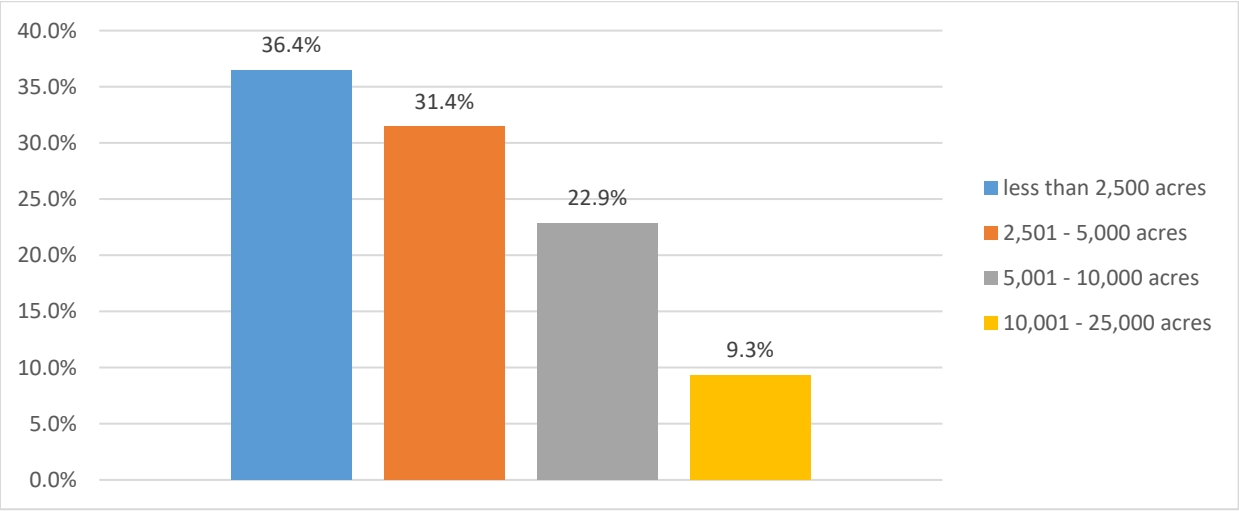
Respondents were asked whether they have an account on the five social media channels provided in the question. Respondents' also had the option 'I do not use social media', as well as the 'Other' option, and they were encouraged to choose all the options that apply to their situation. As Figure 3 illustrates, the majority of respondents use Facebook (60.5%) and Twitter (52.4%), while a quarter of them have an account on LinkedIn. Out of the 124 respondents to this question, 29% stated that they do not have an account on social media. Regarding the 'Other' category, only one person mentioned having an account on 'Instagram'.

Figure 3. Respondents' accounts on social media channels (n=124)



Next, respondents were asked what how many **total crop acres they seeded in 2017**. This was an open-ended question, so respondents wrote down the actual number of cultivated acres. However, for a better visualization of the answers, the 140 responses were clustered into ranges, as shown in Figure 4. More than a third of the respondents (36.4%) seeded less than 2,500 acres, while 31.4% seeded between 2,500 and 5,000 acres. Fewer respondents (22.9%) cultivate between 5,000 and 10,000 acres of various crops, and only 9.3% sow between 10,000 to 25,000 acres. However, the average number of acres cultivated in 2017 by this survey's respondents is 4690, while the standard deviation is 4226.

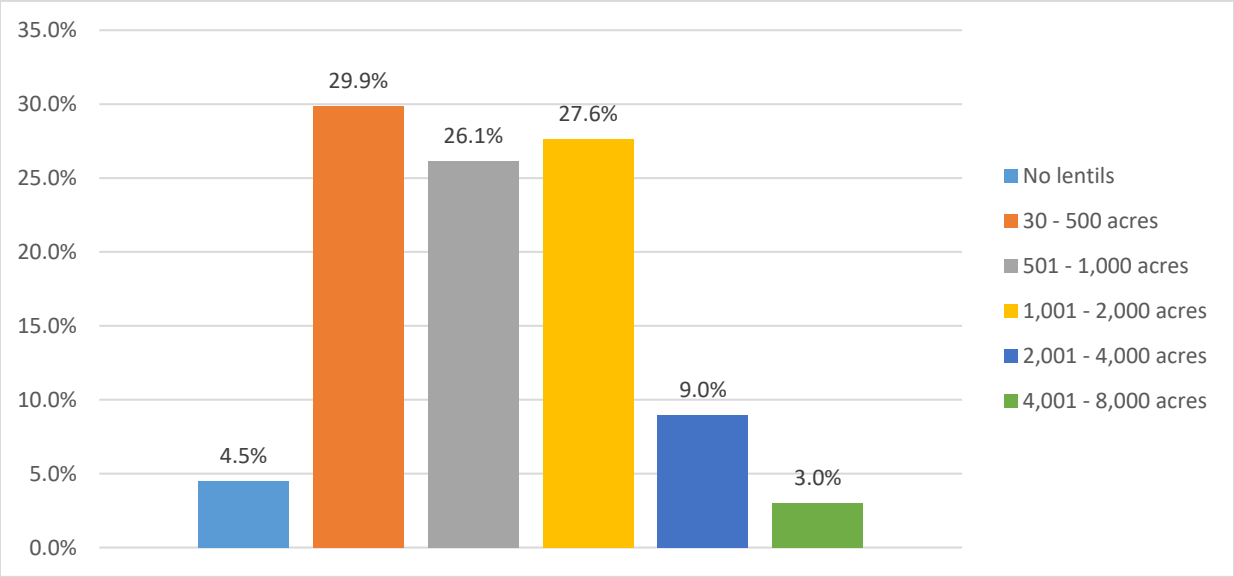
Figure 4. Number of total crop acres seeded by survey respondents (n=140)



The next question asked respondents what number of acres they **planted with lentils** and **other pulse crops in 2017**. With regards to the **number of acres planted with lentils**, Figure 5 shows that 29.9% of the 135 respondents seeded less than 500 acres, 26.1% sowed between 500 and 1,000 acres with lentils and 27.6% seeded between 1,000 and 2,000 acres. Much fewer respondents stated that they grow

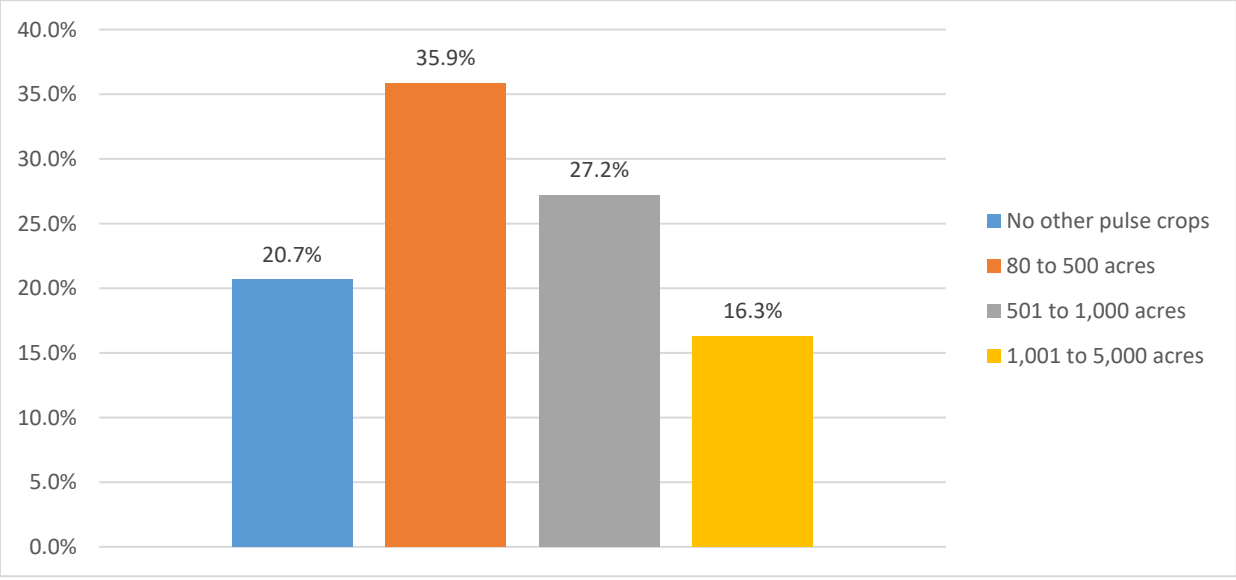
lentils on a range between 2,000 and 4,000 acres, and even fewer planted lentils on a range of acres between 4,000 to 8,000. The average number of acres planted with lentils is 1,178 and standard deviation is 1,274.

Figure 5. Number of acres sown with lentils in 2017 (n=135)



Only 93 respondents answered how many acres of land they planted with **other pulse crops in 2017**. As Figure 6 illustrates, more than a third of the respondents (35.87%) grow other pulse crops on less than 500 acres, 27.17% on plots of land between 500 to 1,000 hectares, and 16.3% on land lots between 1,000 and 5,000 acres. The average number of acres planted with other pulse crops is 652 and standard deviation is 782.

Figure 6. Number of acres sown with other pulse crops in 2017 (n=93)



The next survey question asked respondents **how many years they have been farming, how many years they have been growing lentils** and **how many years they have been growing other pulses**. Again, as they were open-ended questions, the answers had to be clustered into ranges, as shown in Table 1. We found that 67% of the survey respondents have more than 20 years of experience. Those with experience of 10 years or less represent 17.14% of the respondents. The average years of experience for the survey participants is almost 28 years.

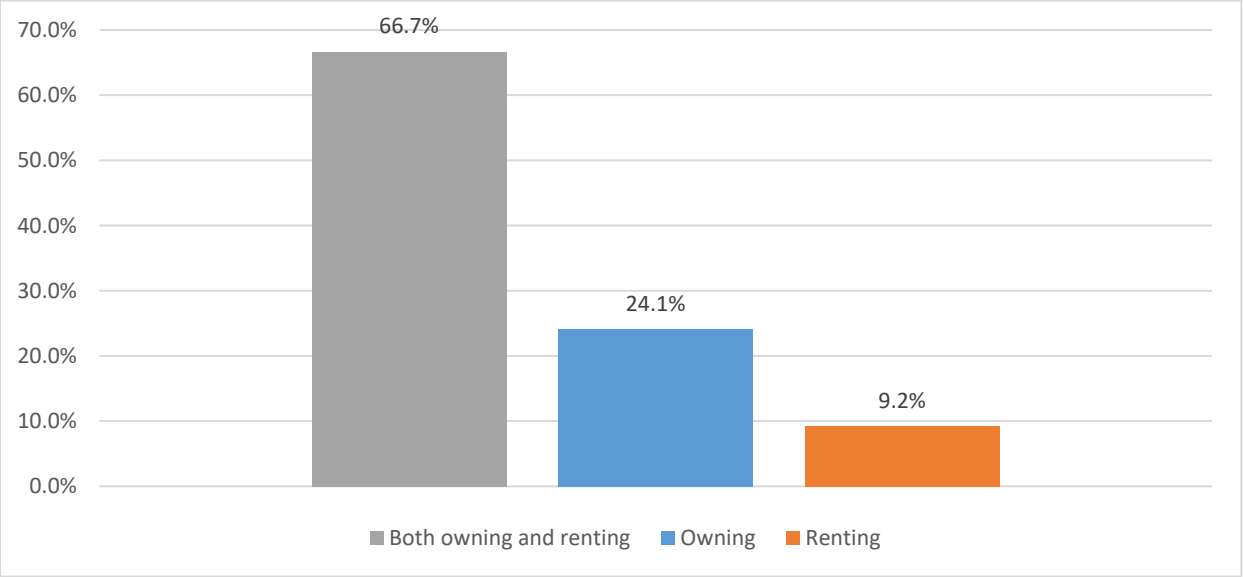
It should be noted that fewer respondents have answered the question regarding the **number of years they have been growing pulses** when comparing to **the number of years of growing lentils** or **experience in farming**, so caution should be used when interpreting the results. However, respondents who have been growing lentils and other pulse crops have a similar experience: 37.5% and 39% have been growing lentils and, respectively, other pulses for less than 10 years, and 39.8% and 36.6% of them have been growing lentils and other pulse crops for 11 to 20 years. On average, respondents have been growing lentils and other pulses for 15 years.

Table 1. Number of years respondents have been farming, growing lentils and other pulses

Range number of years	% respondents farming (n=140)	% respondents growing lentils (n=129)	% respondents growing other pulses (n=82)
0 to 10	17.1%	37.5%	39.0%
11 to 20	15.7%	39.8%	36.6%
21 to 30	25.7%	19.5%	19.5%
31 to 40	22.9%	3.1%	4.9%
41 to 55	18.6%	-	-
Average	27.8	15.4	15

The next question of the survey asked respondents about the **land ownership**. Figure 7 shows that, as expected, the majority of respondents (66.7%) both rent and own the land they are cultivating, while almost a quarter (24.1%) of the respondents cultivate land they own.

Figure 7. Property ownership and/or renting (n=141)



The next question of the survey was formulated as an open-ended type, and asked respondents to **identify the first three reasons for growing lentils**. Respondents offered various answers that had to be clustered into fewer categories for a clearer interpretation. For instance, answers such as 'profits', 'profitability', 'it's a very profitable crop', 'very profitable in most years' were categorized as 'Profitability'. Further, 'rotation', 'rotation fit', 'rotational', 'good for crop-rotation', 'pulse rotation' were entered into the 'Crop-Rotation' category. As Table 2 shows, 'Crop-Rotation', followed by 'Profitability', were top listed as first and second reason, while 'Agronomics' and 'Nitrogen fixation' rank top two categories as the third reason for growing lentils.

Aggregating the reasons for growing lentils, the most mentioned three categories are 'Crop-Rotation', 'Profitability' and 'Agronomics'. When summed up, 'Economics', 'Nitrogen-fixation', 'Price', 'Soil-benefits', and 'Return on investments' categories have a close range of values.

Table 2. Categories of choices (and their aggregate) as the first three reasons for growing lentils

First reason (n=141)	n	Second reason (n=133)	n	Third Reason (n=114)	n	Total	n
Crop-Rotation	57	Crop-Rotation	45	Agronomics	18	Crop-Rotation	**113**
Profitability	33	Profitability	28	Nitrogen-Fixation	15	Profitability	**69**
Returns-on-Investment	12	Agronomics	11	Soil-Benefits	13	Agronomics	**36**
Price	11	Economics	10	Crop-Rotation	11	Economics	**23**
Agronomics	7	Soil-Benefits	7	Harvest-time	9	Nitrogen-Fixation	**22**
Economics	7	Nitrogen-Fixation	6	Profitability	8	Price	**21**
Crop-diversification	5	Price	6	Cheap-to-grow	6	Soil-Benefits	**20**
Value	4	Returns-on-Investment	4	Economics	6	Returns-on-Investment	**17**
Cash-Crop	3	Value	4	Good-fit-for-our-area	4	Crop-diversification	**11**
Nitrogen-Fixation	1	Good-fit-for-our-area	3	Price	4	Harvest-time	**10**
Research-trial	1	Crop-diversification	3	Crop-diversification	3	Value	**9**
		Attachment-reasons	2	Risk-management	3	Cash-Crop	**7**
		Risk-management	2	Weed-control	3	Good-fit-for-our-area	**7**
		Harvest-time	1	Cash-Crop	3	Cheap-to-grow	**6**
		Cash-Crop	1	Cash-flow	3	Risk-management	**5**
				Attachment-reasons	2	Attachment-reasons	**4**
				Returns-on-Investment	1	Weed-control	**3**
				Sustainability	1	Cash-flow	**3**
				Value	1	Sustainability	**1**
						Research-trial	**1**

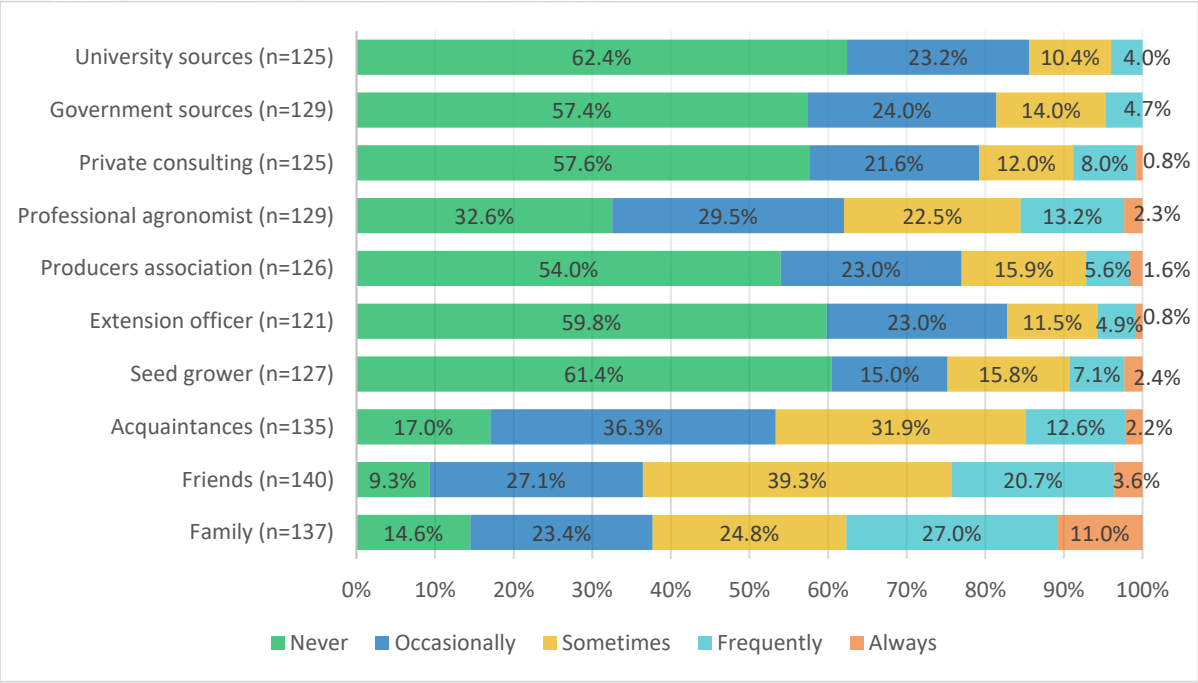
Figure 8 illustrates a word cloud created with the aggregated reasons for growing lentils. For a better visualization of the results, the last four reasons were not included in the word cloud.

Figure 8. Word cloud of total aggregated reasons for growing lentils

5. *Communication frequency and sources of information for lentils in general*

The subsequent question asked respondents to indicate **how often they give advice to others regarding lentil cultivation**. As shown on Figure 9, respondents 'always' and 'frequently' give advice mostly to 'family' (11% and 27%, respectively) and 'friends' (3.6% and 20.7%, respectively). It is interesting to observe that, 'frequently', there is information flow from lentil growers to 'professional agronomists' (13.2%), 'private consulting' (8%), 'producers associations' (5.6%), 'extension officers' (4.9%) or even 'university' (4%) or 'government sources' (4.7%). 'Occasionally' and 'sometimes' offered advice goes mainly to 'acquaintances' (36.3% and 31.9%) and 'friends' (and 27.1% and 39.3%), and as well as to 'professional agronomists' (29.5% and 22.5%).

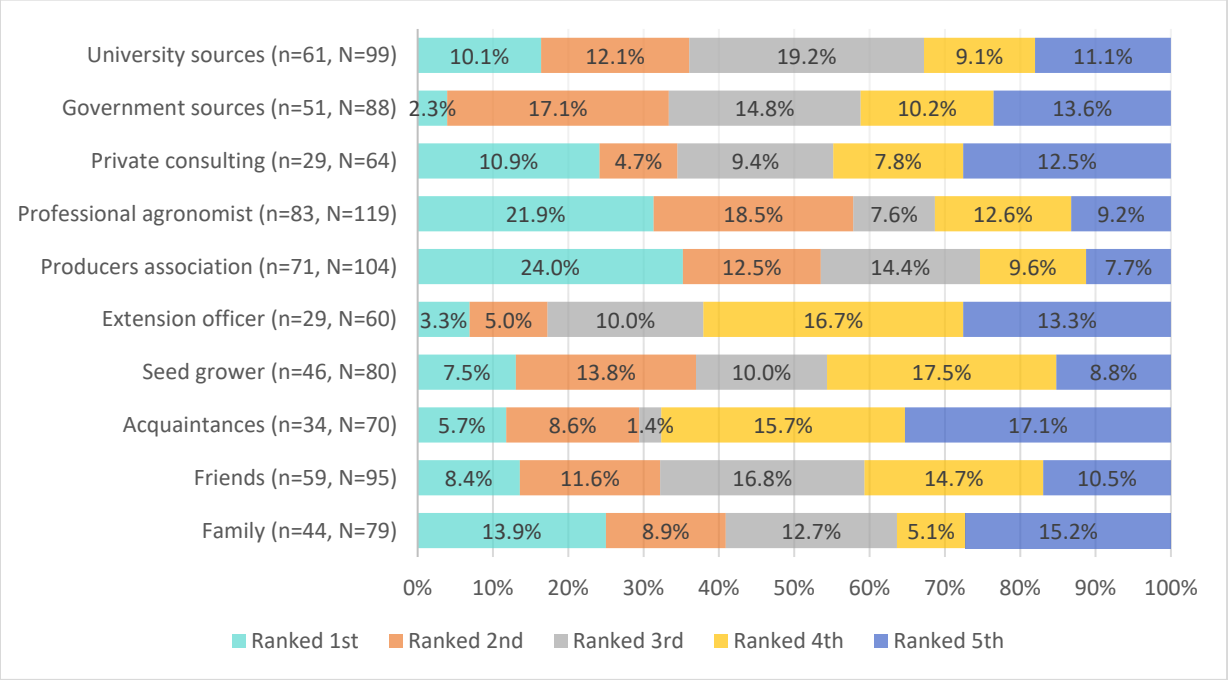
Figure 9. Frequency of giving advice to others (variable n)



The next question asked respondents **to rank only their top 5 most trusted sources of information with regards to lentil production in general**, where 1 meant the most important source, and 5 meant the least important source. Unfortunately, many respondents did not follow the instructions, and either used five check marks to indicate their choices, or ranked two or more options with the same rank. We did not include the incorrect responses in this analysis. Figure 10 shows only the percentage of respondents who ranked the options from 1 to 5, as required in the question. For each of the categories, lowercase 'n' indicates the number of respondents who ranked correctly and also chose that respective category, while capital 'N' indicates the total number of respondents who chose that category, irrespective of whether they ranked correctly or not.

However, this chart should be carefully interpreted considering the big differences in the number of responses for each category (*n*). Nevertheless, the two most mentioned categories ranked on the first place are 'producers associations' (24%) and 'extensions officers' (21.9%); the two most mentioned categories ranked second are 'producers associations' (18.5%) and 'government sources' (17.1%), the two most mentioned categories ranked third are 'university sources' (19.2%) and 'friends' (16.8%), the two most mentioned categories ranked fourth are 'seed growers' (17.5%) and 'extension officers' (16.7%), while the two most mentioned categories ranked fifth are 'acquaintances' and 'family'.

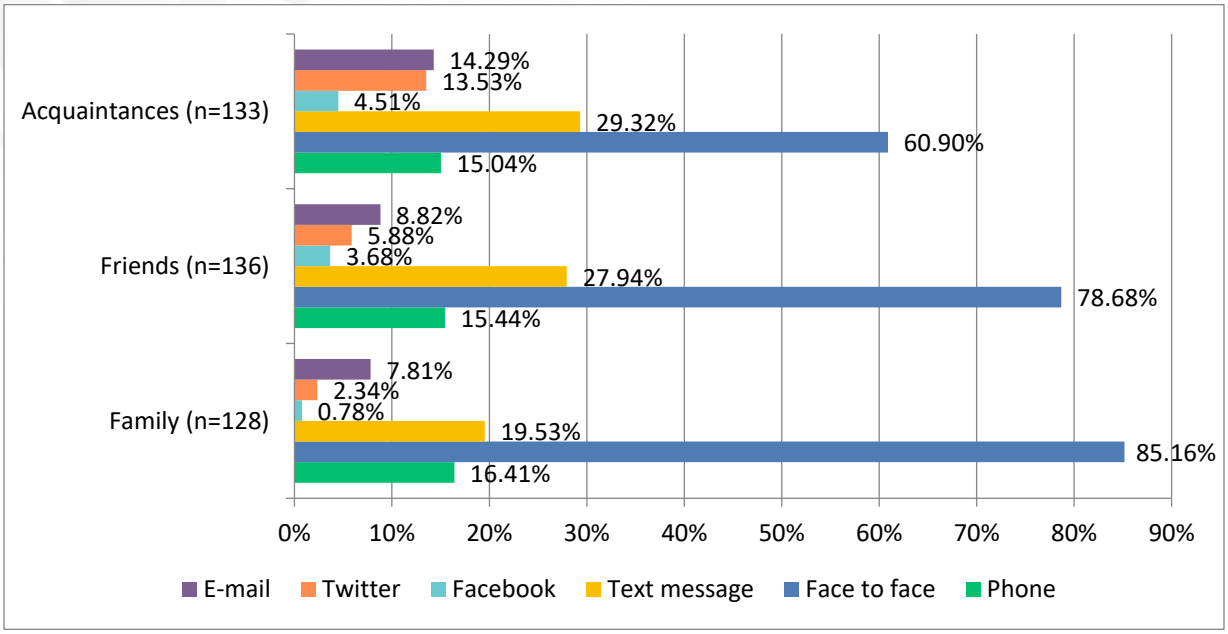
Figure 10. Percentage of respondents who ranked the categories as required, with 1 being the most trusted source and 5 the least important source (variable n)



The next question asked respondents what are the **preferred channels of communication about lentil growing** with friends, family, and acquaintances. As shown on Figure 11, survey respondents mainly prefer 'face to face' communication for all three categories, followed by 'text messages', and 'phone conversations'. 'Twitter' and 'email' are more used in the communication with acquaintances. Respondents also had an 'other' option[3] 7 respondents indicated that they prefer to communicate with agronomists as follows: 'face to face' (3 individuals), by 'email' (2 individuals), by 'text' (2 individuals) and by 'phone' (1 individual). Other respondents shared with us their preference to communicate with producer associations via 'twitter' and 'email' (1 individual), with seed growers via 'email' (1 individual), and with the ministry of Agriculture via 'text message' (1 individual). One person identified the 'farm blog' as preferred way to communicate, and another person mentioned 'newsletters'.

[3] Throughout the survey respondents seem to use the 'other' option to carry on answer options from the previous question.

Figure 11. Respondents' most preferred channels of communications about lentil growing (variable n)



6. *New lentil varieties – trials, communication frequency and sources of information*

The following question asked respondents **how many lentil varieties**, regular market class and niche varieties, **they had considered planting in the past five years**, **how many they had trialed in the past 5 years** and **how many they actually planted for more than one year**. A total of 132 respondents partially or completely answered these questions. There were 25 respondents who answered that they have considered planting or trialed 100 lentil varieties for both regular class and niche varieties. As the number of existing lentil varieties is definitely less than 100, those responses were interpreted as 'numerous varieties' trialed or considered and, with the goal of avoiding result interpretation bias, they were removed when quantifying the responses. Thus, out of the remaining 107 respondents, 23 indicated that they are planting both regular and niche market varieties. For both regular and niche varieties, most of the respondents considered, trialed and planted mostly 1 or 2 varieties. Only few growers indicated that they considered, trialed and planted 3 or 4 varieties.

Out of 107 respondents, 58 considered, trialed or planted regular market varieties only. Most of them indicated that they contemplated mainly 1, 2 and 3 varieties. Only one grower mentioned that he contemplated 10 varieties, trialed 7 and actually planted 5. Also one respondent considered, trialed and planted 9 varieties. Out of the 58 growers, only 6 considered, trialed or planted between 4 to 6 varieties.

With regards to niche market varieties, 26 respondents considered, trialed or planted niche varieties only. Most of them considered, trialed or planted 1 or 2 varieties. Only 3 respondents planted 3 different varieties.

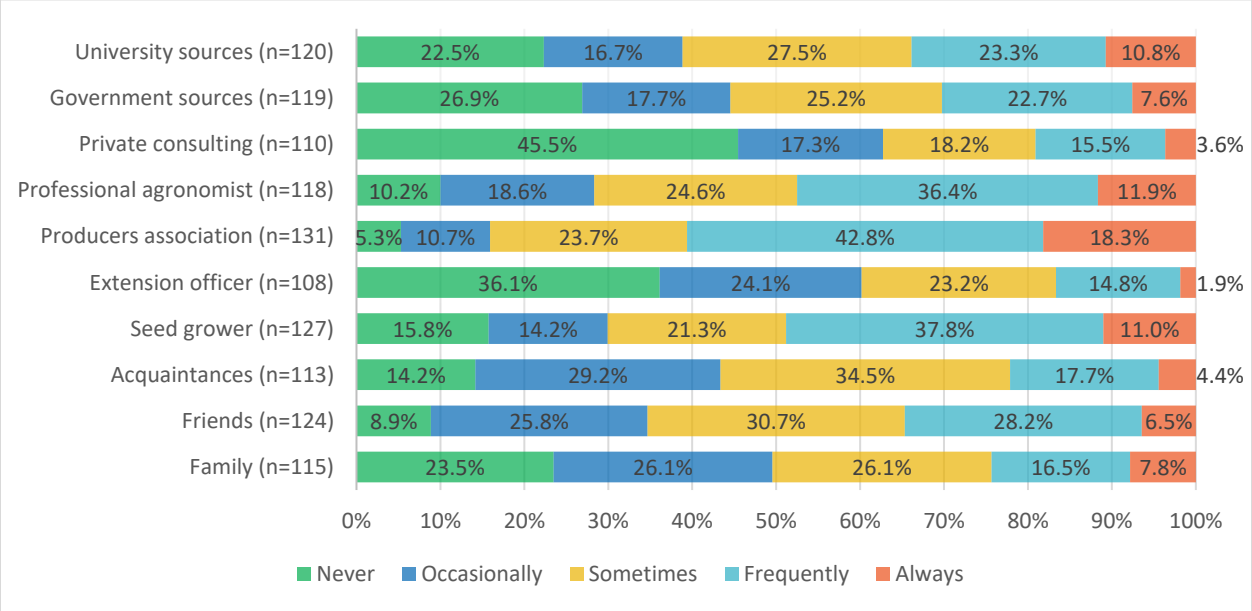
Thus, Table 3 shows the average, mean and standard deviation of respondents' answers for both **regular market class** and **niche varieties**. The values illustrate that growers were interested in, trialed and planted more regular market class varieties when compared to respondents who considered, trialed and planted niche varieties.

Table 3. Number of regular market class and niche varieties that respondents considered planting, trialed and actually planted

	Regular market class (n=58)			Niche varieties (King red, Queen green, etc.) (n=26)		
	Median	Mean	Std.Dev.	Median	Mean	Std.Dev.
Considered for planting in the past 5 years	2	2.48	1.79	1	1.43	1.01
Trialed in the past 5 years	2	1.94	1.66	1	1.41	1.04
Planted more than 1 year	1	1.77	1.34	1	1.20	0.90

The subsequent question asked respondents **how often they use the following contacts to become aware of the existence of new lentil varieties**. Figure 12 shows that respondents 'always' and 'frequently' contact 'producers associations' (18.3% and 42.8%), 'professional agronomists' (11.9% and 36.4%) and 'seed growers' (11% and 37.8%). 'University sources' (10.8% and 23.3%), 'government sources' (7.6% and 22.7%) and 'family' (7.8% and 16.5%) rank next as 'always' and 'frequently' sought for getting information about the existence of new lentil varieties. Six respondents chose to specify in the 'Other' field that the 'Seed guide' (even though this can be included in the 'government sources' category) is 'frequently', 'always' or 'occasionally' consulted. Plant breeders and the Crop Development Centre (CDC) were nominated as well as sources of information on the existence of new lentil varieties.

Figure 12. Frequency of using contacts to become aware of new lentil varieties' existence (n=139)

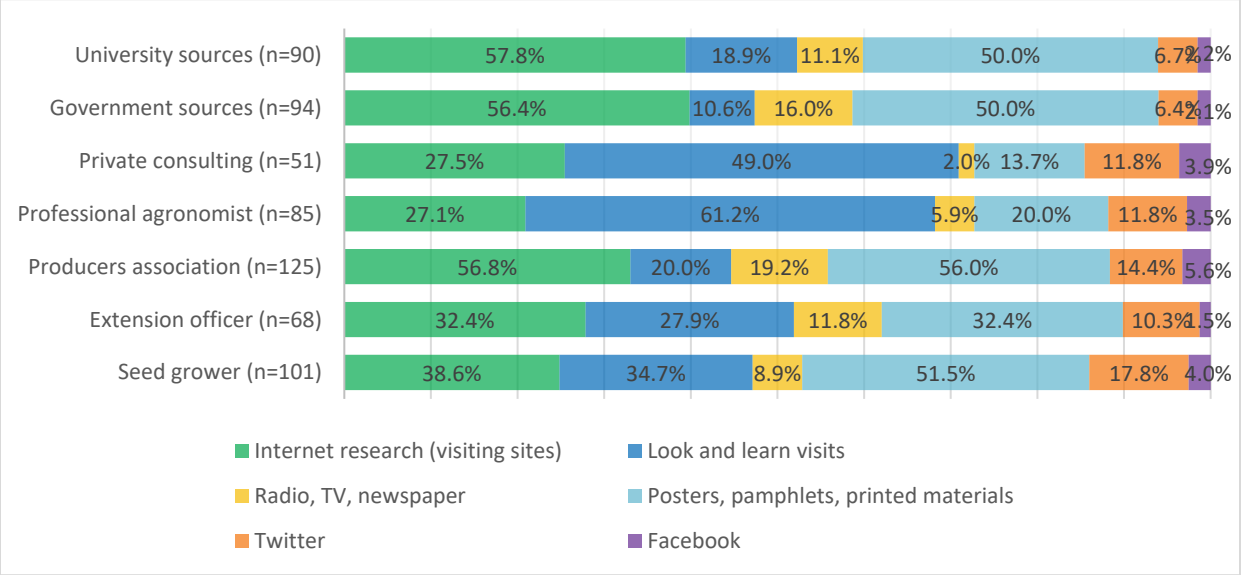


The following question asked respondents how they find out **general information about new lentil varieties**. As Figure 13 shows, respondents' answers indicate that with regards to 'university' and 'government sources', as well as 'producers' associations', the most preferred sources of information are 'internet research' (57.8%, 56.4% and 56.8% respectively) and 'printed materials' (50%, 50% and 56% respectively). 'Private consulting' and 'professional agronomist' have very close percentages for all

categories presented, however, the most preferred ones are 'look and learn visits' (49% and 61.2%), followed by 'internet research' (27.5% and 27.1%) and 'printed materials' (13.7% and 20%). 'Seed growers' and 'extension officers' categories show somehow close values; the answers for these two choices indicate that respondents prefer 'printed materials' (51.5% and 32.4%), 'look and learn' visits (34.7% and 27.9%), followed by 'internet research' (38.6% and 32.4%).

Communication via 'Twitter' is followed less from 'university' (6.7%) and 'government sources' (6.4%) compared to the other categories presented. In the meantime, general information about lentil growing received via 'radio, TV or newspapers' is appreciated particularly when it comes from 'producers association' (19.2%), 'government sources' (16%), 'extension officers' (11.8%), 'university sources' (11.1%), and 'seed growers' (8.9%). 'Facebook' seems to have a very low informational impact with this respect for all categories. Respondents also took advantage of the 'other' field and detailed that they prefer to communicate with 'seed growers' 'face to face' (in 7 instances) or by 'phone' (1 instance); other respondents indicated their interest for 'face to face' meetings with a 'professional agronomist' (4 instances) and 'extension officer' (2 instances). It is interesting to note that eight respondents explained that 'grower meetings' are very important source of information for them, even if they are organized by either seed growers, producers associations, or university. CDC and the 'seed guide' were again mentioned as a source of information through the use of 'printed materials'.

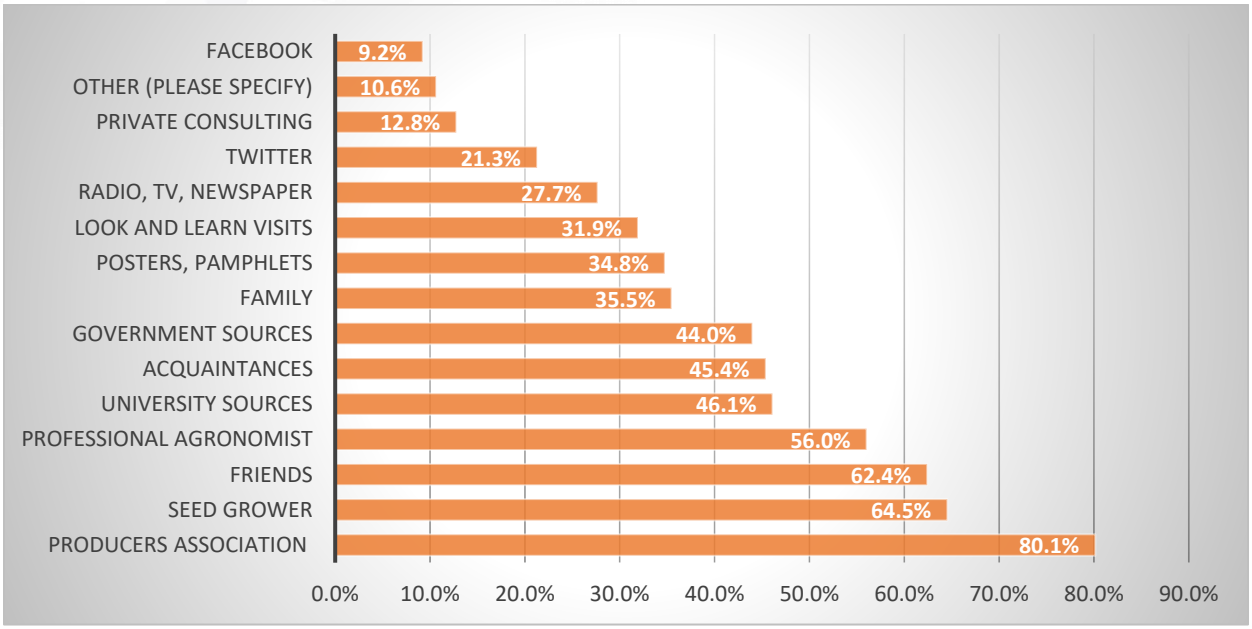
Figure 13. Respondents' preferred sources of general information about new lentil varieties



In the next question of the survey, respondents were asked **where from they learn about new lentil varieties advantages and challenges**. Respondents were encouraged to choose all the options that apply. Figure 14 shows that an overwhelming percentage of respondents (80.1%) chose 'producers association' as source of information about new lentil varieties advantages and challenges. 'Seed growers' (64.5%), 'friends' (62.4%) and 'professional agronomists' (56%) are subsequently ranked, at more than 15% difference from 'producers association'. 'University sources' (46.1%), 'acquaintances' (45.4%), and 'government sources' (44%) are ranked by at least 10% higher than 'family' (35.5%), 'printed materials' (34.8%) and 'look and learn visits' (31.9%). 'Facebook' and 'private consulting' were

ranked last. In the 'Other' category respondents mentioned 'Seed guide' (7 instances), producers' association meetings (2 instances), CDC (1 instance), buyers (1 instance), trade shows (1 instance), retailer (1 instances), and internet research (1 instance).

Figure 14. Respondents sources of information about new lentil varieties advantages and challenges (n=141)



Respondents were next asked to rank only the **top 5 people and/or institutions whose advice influenced them most with regards to which new lentil variety to actually grow**, where 1 meant the most important and 5 meant the least important. Again, many respondents did not follow the instructions, and either used five check marks to indicate their choices, or ranked two or more options with the same rank. Figure 15 shows the percentage of respondents who ranked the options, as required, from 1 to 5.

Figure 15. Respondents' ranking from 1 to 5 the top 5 most people and/or institutions whose advice influenced them most with regards to which new lentil variety to actually grow

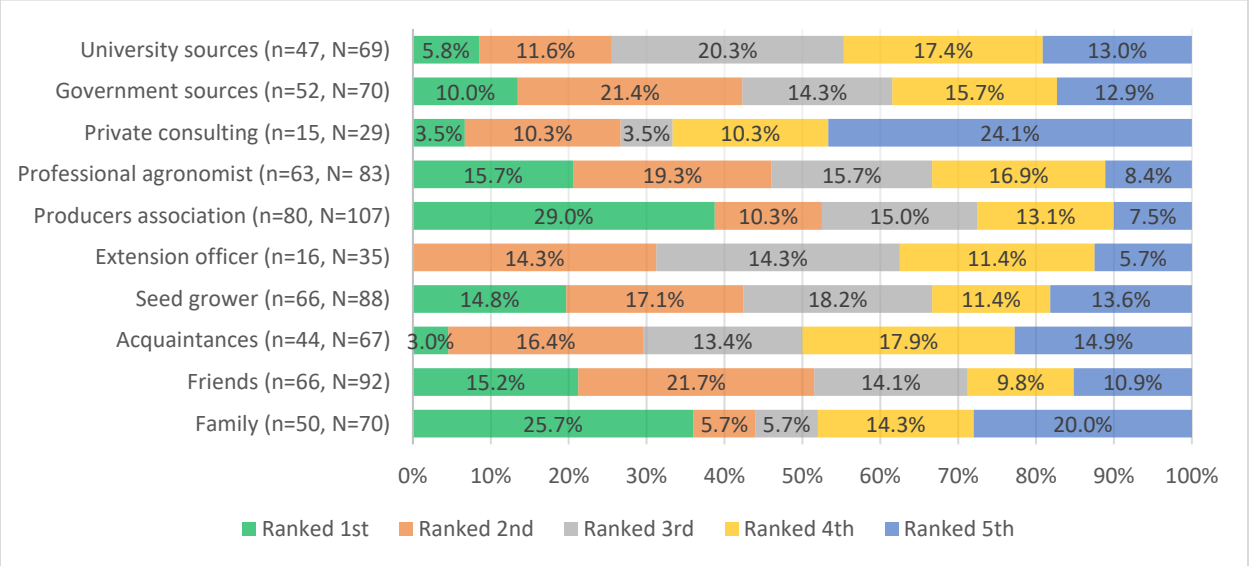
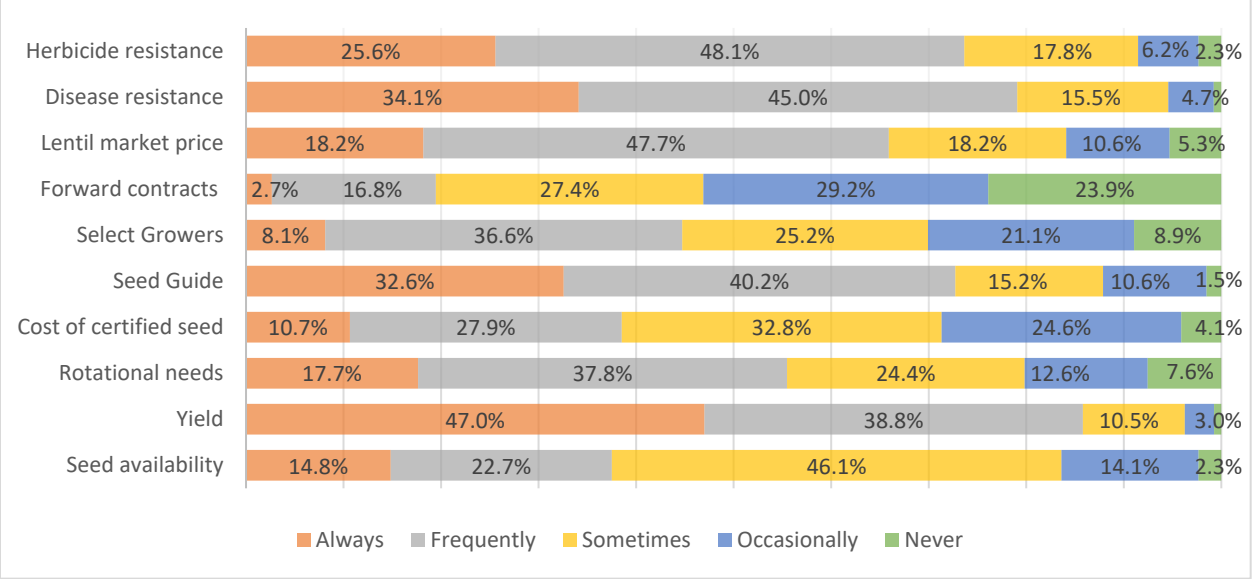


Figure 15 should be carefully interpreted considering the big differences in the number of responses for each category (*n*). Again, lowercase 'n' indicates the number of respondents who ranked correctly and also chose that respective category, while capital 'N' indicates the total number of respondents who chose that category, irrespective of whether they ranked correctly or not. Nevertheless, the two most mentioned categories ranked on the first place are 'producers associations' (29%) and 'family' (25.7%); the two most mentioned categories ranked second are 'friends' (21.7%) and 'government sources' (21.4%), the two most mentioned categories ranked third are 'university sources' (20.3%) and 'friends' (18.2%), the two most mentioned categories ranked fourth are 'acquaintances' (17.9%) and 'university sources' (17.4%), while the two most mentioned categories ranked fifth are 'private consulting' (24.1%) and 'family' (20%). In the 'Other' category, respondents had ranked the 'seed guide' as first (one instance), second (twice) and third (one instance). University sources and CDC were mentioned again, as well as the seed buyer, retailer, and seed companies (each of them mentioned once).

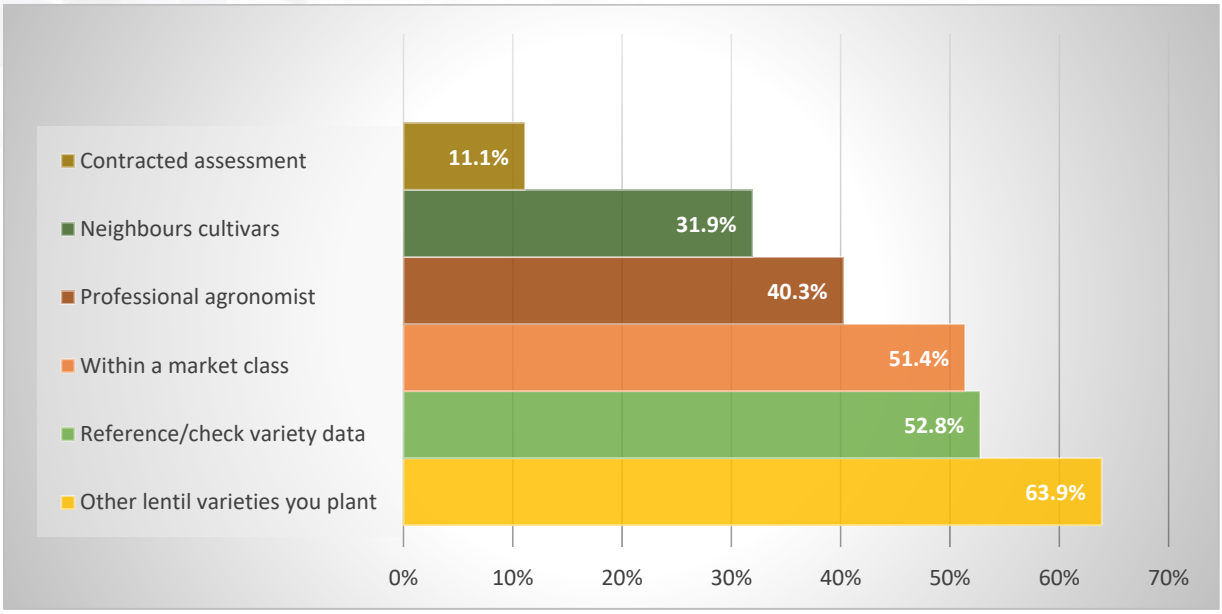
The next question asked **respondents which of the factors presented influences their decision to cultivate a new lentil variety**; respondents were asked to check all answers that apply. Figure 16 shows that most important factor that influences their decision 'always' (47%) and 'frequently' (38.8%) is the 'yield', followed by the 'disease resistance' factor (34.1% and 45%), the 'seed guide' (32.6% and 40.2%) and 'herbicide resistance' (25.6% and 48.1% respectively). The 'lentil market price' (18.2% and 47.7%) and the 'rotational needs' (17.7% and 37.8%) are also 'always' and 'frequently' mentioned.

Figure 16. Factors that influence respondents' decisions to cultivate a new lentil variety (n=140)



The following question asked respondents whether they **formally track and assess the performance of lentil cultivars**. Figure 17 illustrates that, out of 138 respondents, 52.2% answered in the affirmative, 42.8% stated that they do not formally track and assess the lentil cultivars' performance, and 5% preferred not to respond. Participants that acknowledged that they formally track and assess the performance of lentil cultivars were consequently asked to indicate what comparators they use. They were provided with six choices and an 'other' field. The majority of respondents (63.9%) compare the lentil cultivars with 'other lentil varieties' they planted; 52.8% compare lentils 'within a market class', 51.4% use 'reference/check variety data', 40.3% discuss with 'professional agronomist' and 31% compare with 'neighbors cultivars'.

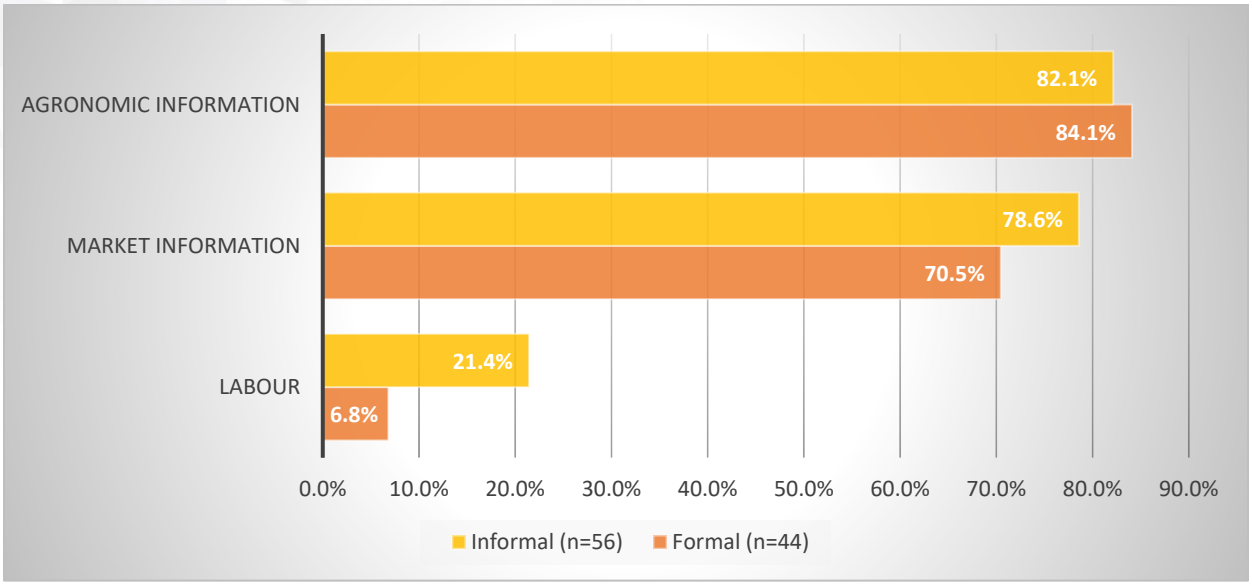
Figure 17. Comparators used by respondents to assess the performance of lentil cultivars (n=72)



7. Formal and informal networks

The next request was formulated as an open-ended question which asked survey participants whether they are **part of formal or informal networks that exchange information**. Only 10 individuals indicated that they are part of one formal network, and 2 respondents indicated that they are part of two formal networks. The answers were as follows: seed company, processing plant, grower group, CSGA (twice), college friends (twice), pulse growers, SSGA, SPG and neighbours. With regards to informal networks, 7 respondents mentioned Twitter (three times), neighbours, grower meetings, industry contact's, coffee row, acquaintances, demo tours, professionals, Facebook, and extension officer. Four individuals indicated that they belong to two informal networks and one individual mentioned three informal networks. However, only two respondents belong to both a formal and an informal network. Respondents were also **asked what type of information they exchange in their formal and informal networks**. It is interesting to observe that, as mentioned above, even only few survey participants had actually named the formal (n=10) or informal network (n=7), significantly more respondents indicated the type of exchange they have within a formal (n=44) and within an informal network (n=56). As Figure 18 shows, for both formal and informal networks, respondents exchange mainly agronomic information, followed by market information and, at a significant distance, by labour exchange. As expected, there is three times more labour exchange in the informal networks versus the formal ones, while market and agronomic information exchanges show similar values for both types of networks.

Figure 18. Respondents' type of information exchanged in formal and informal networks



8. Questionnaire

Project Title: Application of Genomic Innovation in the Lentil Economy (AGILE)

Supervisor:	Researcher:
Peter WB Phillips Distinguished Professor Johnson Shoyama Graduate School of Public Policy University of Saskatchewan (306) 966 4021 Peter.phillips@usask.ca	Simona Lubieniechi Professional Research Associate Dept. of Bioresource Policy Business and Economics University of Saskatchewan (306) 966 4043 Simona.lub@usask.ca

Consent Form

The study in which you have been invited to participate is concerned with investigating how lentil farmers make decisions with regards to lentils cultivation. We want to determine whether social perceptions influence individual choices of existing and new lentil varieties in the crop rotation. Participation in this study will take 10 to 15 minutes. As a sign of appreciation for your time and help with this study, you will receive a $5 Tim Horton's gift card for completing this survey. Please feel free to ask any questions regarding the procedures and goals of the study or your role.

Participation in this survey is voluntary, and you can decide to not participate at any time by returning the survey to the person who handed it to you, or by choosing to not answer any questions with which you feel uncomfortable. Declining to answer any particular question will not undermine the integrity of the survey.

All your responses are confidential and no identifiable information will be collected. Your responses will be safely stored on password protected computers and locked file cabinets. Your responses will be kept for 5 years under the above security conditions. Your responses will be shredded or deleted 5 years after the completion of the study. There are no known risks to participating in this survey.

This research project has been approved on ethical grounds by the University of Saskatchewan Behavioural Research Ethics Board. Any questions regarding your rights as a participant may be addressed to that committee through the Research Ethics Office ethics.office@usask.ca (306) 966-2975. Out of town participants may call toll free (888) 966-2975.

By completing and submitting this questionnaire, **your free and informed consent is implied** and indicates that you understand the above conditions of participation in this study.

Please consider keeping this page for your records.

Sincerely,

Peter WB Phillips
Distinguished Professor
Johnson Shoyama Graduate School of Public Policy
University of Saskatchewan, (306) 966 4021
peter.phillips@usask.ca

1. Are you involved in farm-level related decision making? Please check the appropriate box.

Yes	
No	

IF NO, thank you for your interest. We have no further questions for you.

2. Have you grown lentils within the past 5 years (since 2012)? Please check the appropriate box.

Yes	
No	

IF NO, thank you for your interest. We have no further questions for you.

3. What Province do you farm in? Please check the appropriate box.

Saskatchewan	
Alberta	
Manitoba	
Other	

4. How many total crop acres did you seed on your farm in 2017?

5. How many acres did you plant in 2017 with the following crops? How many years have you been growing these crops?

	# of acres planted	**# of years**
Lentils		
Other pulse crops		

6. How many years have you been farming?

7. Do you currently own or rent the land where you grow lentils? Please check the appropriate box.

Owner	
Renter	
Both owning and renting	
Prefer not to say	

8. Please list the first 3 reasons why you decided to grow lentils:

9. Please choose how often **you give advice to others** regarding lentil cultivation:

Categories	**Never**	**Occasionally**	**Sometimes**	**Frequently**	**Always**
Family					
Friends					
Acquaintances					
Seed grower					
Extension officer					
Producers association (e.g. Saskatchewan Pulse Growers Association)					
Professional agronomist					
Private consulting					
Government sources					
University sources					
Other (please mention)					

10. Please **rank your top 5 most trusted sources of information** with regards to lentil production in general, where 1 means the most important source to you and 5 the least important source.

Categories	**Rank**
Family	
Friends	
Acquaintances	
Seed grower	
Extension officer	
Producers association (e.g. Saskatchewan Pulse Growers Association)	
Professional agronomist	
Private consulting	
Government sources	
University sources	
Other (please mention)	

11. How do you prefer **to communicate about lentil growing** with the following?

	Phone	**Face to face**	**Text message**	**Facebook**	**Twitter**	**E-mail**	**Other (please mention)**
Family							
Friends							
Acquaintances							
Other (please mention)							

12. How **many lentil varieties** have you:

	Niche varieties (e.g.: King red, Queen green, etc.)	**Regular market class**
Considered for planting in the past 5 years		
Trialed in the past 5 years		
Planted more than 1 year		

13. Of the following, how often do you use these contacts **to become aware of the existence of new lentil varieties**?

	Never	Occasionally	Sometimes	Frequently	Always
Family					
Friends					
Acquaintances					
Seed grower					
Extension officer					
Producers association (e.g.: Saskatchewan Pulse Growers Association)					
Professional agronomist					
Private consulting					
Government sources					
University sources					
Other (please mention)					

14. How do you find out **general information about new lentil varieties** for the following? Please check all that apply.

	Internet research (visiting sites)	**Look and learn visits**	**Radio, TV, newspaper**	**Posters, pamphlets, printed materials**	**Facebook**	**Twitter**	**Other, please mention**
Seed grower							
Extension officer							
Producers association (e.g.: Saskatchewan Pulse Growers Association)							
Professional agronomist							
Private consulting							
Government sources							
University sources							
Other (please mention)							

15. Where do you learn about **new lentil varieties advantages and challenges**? Please check all that apply.

Category	
Family	
Friends	
Acquaintances	
Seed grower	
Extension officer	
Producers association (e.g. Saskatchewan Pulse Growers Association)	
Professional agronomist	
Private consulting	
Government sources	
University sources	
Look and learn visits	
Radio, TV, newspaper	
Posters, pamphlets	
Facebook	
Twitter	
Other (please mention)	

16. Please **rank the top 5 people and/or institutions whose advice influenced you most with regards to which new lentil variety to actually grow**, where 1 is the most important and 5 is the least important.

Categories	**Rank**
Family	
Friends	
Acquaintances	
Personal decision	
Seed grower	
Extension officer	
Producers association (e.g. Saskatchewan Pulse Growers Association)	
Professional agronomist	
Private consulting	
Government sources	
University sources	
Other (please mention)	

17. Which of the following factors influences your decision **to cultivate a new lentil variety**? Please check all that apply.

	Never	Occasionally	Sometimes	Frequently	Always
Seed availability					
Yield					
Rotational needs					
Cost of certified seed					
Agronomic information provided by the Seed Guide					
Agronomic information provided by Select Growers					
Forward contracts for specialty market classes					
Lentil market price					
Disease resistance					
Herbicide resistance					
Other (please mention)					

18. Do you formally **track and assess performance of lentil cultivars**? Please check the appropriate box.

Yes	
No	
Prefer not to respond	

19. If YES, what **comparators** do you use? Please check the appropriate box.

Categories	
Within a market class	
Other lentil varieties you plant	
Reference/check variety data	
Professional agronomist	
Contracted assessment	
Neighbours cultivars	
Other (please mention)	

20. Are you part of a formal or informal networks that exchange information? Please list your main ones and check the appropriate exchange or market information columns.

	Labour exchange	Market information shared	Agronomic information shared	Other (please mention)
Formal membership (e.g.: Select Seed Growers Association)				
Informal membership (e.g.: Coffee Row)				

21. What gender do you identify with?

Male	
Female	
Prefer not to identify	

22. What is your age?

Under 30	
30-55	
Over 55	
Prefer not to say	

23. What is the highest level of education have you completed?

High school or less	
Some or all of a technical diploma including an apprenticed trade	
Some or all of an undergraduate degree	
Some or all of a graduate degree	
Other (Please specify)	

24. Please indicate the number of your Rural Municipality (RM) or the Municipal District name

25. Do you have an account on any of the following social media? Please check all that apply.

I do not use social media	
LinkedIn	
Facebook	
Twitter	
Personal blog	
Research Gate	
Other (Please mention)	

If you would like to receive the results of this study, you can leave your email address below!

Are you willing to accept a $5 Tim Horton's gift card from us? Please tick the appropriate box.

Yes	
No	

Thank you for your participation! Research like this depends on participants like you!

9. References

Statistics Canada, 2017 [1] Farm and Farm-Operator Data: Saskatchewan remains the breadbasket of Canada, https://www150.statcan.gc.ca/n1/pub/95-640-x/2016001/article/14807-eng.htm [1]

Statistics Canada, 2017 [2] Number of Farm Operators Classified by Farm Type and Educational Attainment, https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3210002401&pickMembers%5B0%5D=1.9 [2]

Nakuja, T. (2016) Factors Influencing Pulse Adoption in Western Canada