Canola Production Survey

Three-Year Survey Consisting of Data From 2019-2021

Conducted by

The Irrigation Crop Diversification Corporation (ICDC) and
Ministry of Agriculture

ICDC
Irrigation Crop Diversification Corporation

Saskatchewan

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Introduction

For the past three years, ICDC and the Ministry of Agriculture have carried out a Canola Production Survey of the canola grown under irrigation in the Lake Diefenbaker area. Canola generally makes up 30 per cent of the irrigated crop mix in Saskatchewan. The survey tracked the agronomic practices and yields of 15 producers using irrigation over a three-year period. The main purpose of the survey was to identify trends and best management practices and to inform new and existing irrigators of methods to maximize yields and profitability of irrigated canola.

Objectives of the Survey

Establish real world Best Management Practice's (BMPs) to produce canola under irrigation. Data collected in the survey consisted of the following parameters:

Variety, nitrogen fertility, phosphorous fertility, seeding date, establishment, crop protection, water management and harvest methods.

Data Collection

For each of the three years, the producers where surveyed to monitor their agronomic practices and water management. At the start of each crop year producers were asked to provide all agronomic practices they were implementing, see Table 1. They were also contacted in season to monitor all in-crop applications, which included type of application, product used and volumes. Harvest data was then collected by means of grain wagon or yield monitors of combines.

Table 1: Initial Production Survey

A	Seeding date	
B	Variety	
C	Previous crop	
D	Pre-seed Herbicide	
E	Fertility	
F	Seeding rate	
G	Row spacing	
H	Target yield	

Water management was measured by placing a rain gauge under the pivot and one in the dryland corner to allow for the calculation of rainfall and irrigation. The gauges where checked weekly and volumes were recorded.

Moisture was monitored by entering the weekly rain gauge values into the Alberta Irrigation Management Model (AIMM) which produced chart to show field water capacity and predict water use, see Table 2.

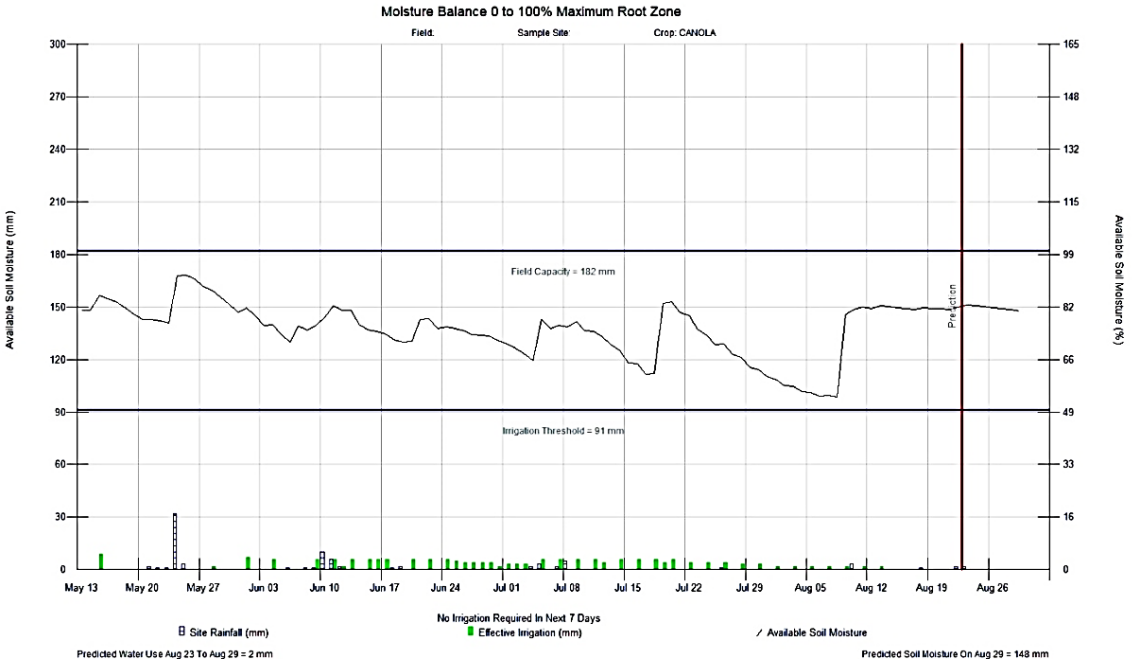


Table 2: AIMM Chart

All the data was entered in excel spreadsheets for each year of the survey. The data was then examined and analyzed for trends.

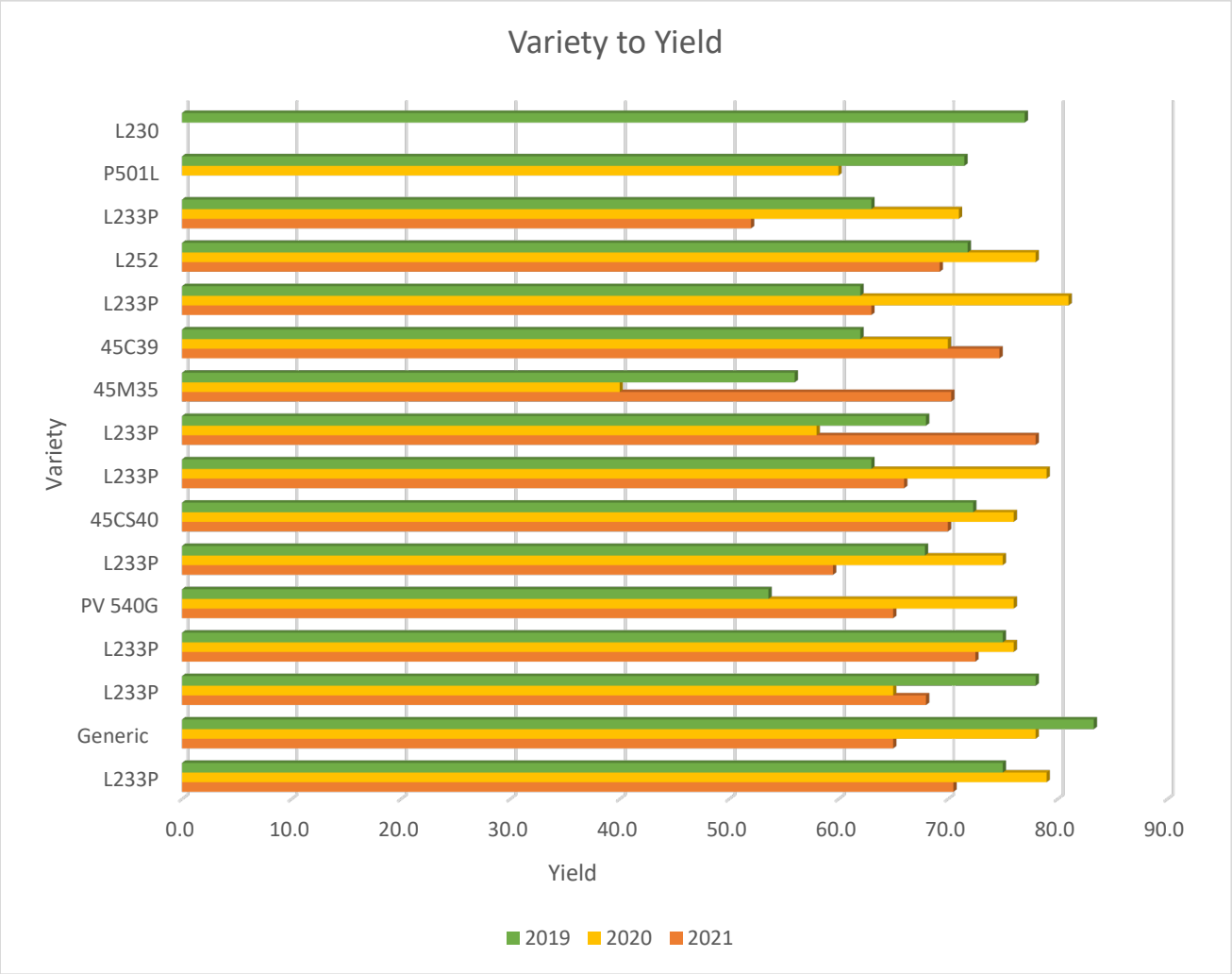
Results and Discussion

The yield results of the survey were consolidated, and these are the trends. The average yield over the course of the survey was 69 bu./ac. over all districts. The highest yield was 83 bu./ac. (from 2019). The average yield for 2019 was 69 bu./ac. 2020 average was 70 bu./ac. and 2021 was 67 bu./ac. Somewhat surprisingly, the hot and dry growing conditions experienced in 2021 only caused a slight decrease in average yields. Over the course of the study, the average yield in South Saskatchewan Irrigation District (SSRID) was 69 bu./ac. Luke Lake Irrigation District (LLID) average was 70 bu./ac. and Riverhurst Irrigation District (RID) had an average of 65 bu./ac.

1. Variety

There was a wide selection of varieties that were utilized over the course of the study. From the collected data the yield obtained can be compared by variety. The most common varieties tended to be from either InVigor or Pioneer brands. InVigor showed consistent results under irrigation with slight yield differences within varieties. InVigor L233P seems to be on the leading edge and better suited to irrigation, see Graph 3, it is the most commonly seeded variety of canola consisting of 37 per cent of varieties sown over the three years. InVigor L357P has similar characteristics as L233P but producers have reported it is slow to dry down, even after desiccation and is more prone to lodging. Some producers noted that this variety tended to drop full pods from the plant which resulted in some yield losses.

Graph 3: Variety and Yield Comparison, data from 2019, 2020 and 2021



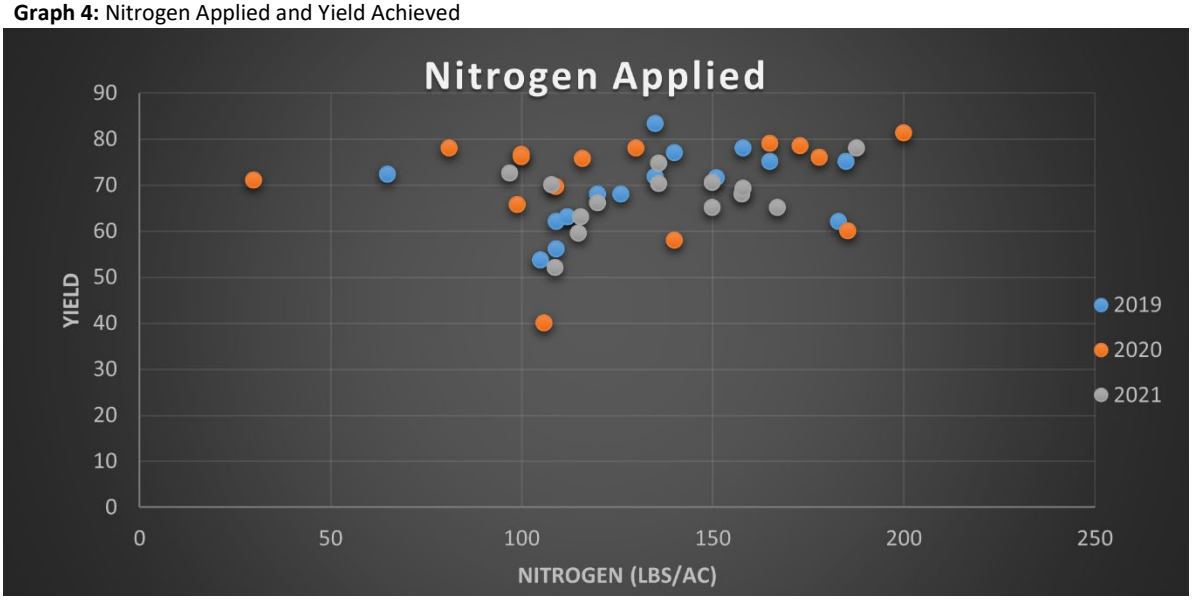
2. Nitrogen Fertility

In the survey we found that roughly half of the producers' soil test to help inform fertility decisions. The data we are presenting, only focuses on the total nitrogen applied. It is always recommended to soil test prior to determining fertilizer rates.

Nitrogen types and applications varied from producer to producer. The main trend that emerged is that under irrigation 4R practice, **Right** fertilizer source at the **Right** rate, at the **Right** time and in the **Right** place, is strongly implemented. Crops respond well to split applications of fertilizer.
Rates of 130-160 lb./ac. actual Nitrogen (N) showed the best return on investment over the three years. In 2019 and 2020 there were a few fields that hit 70 plus bushels with less than 100 lbs. of N applied. The 2019 field had high soil N level as a result from the previous year's potato crop. The 2020 fields also had higher soil levels of N carry over from the previous year, the difference with 2020 is each field had a different preceding crop, flax, wheat and dry beans. Beans are a legume, so

they will have contributed to the N level in the soil. The higher levels of soil N in the other fields can be a result of either low yields, where the N wasn't used, or soil building program where additional nutrients are applied to build up soil levels. The survey also showed a plateau effect (diminishing return on investment), see Graph 4, once rates reached 200 lb./ac. of actual N. Producers applied their nitrogen in at least two-three applications. The methods of choice are banding in fall, broadcast pre-seeding, applied with seeding equipment and top dressing or fertigation in crop, at a rate of 35 lbs./ac. N applied.

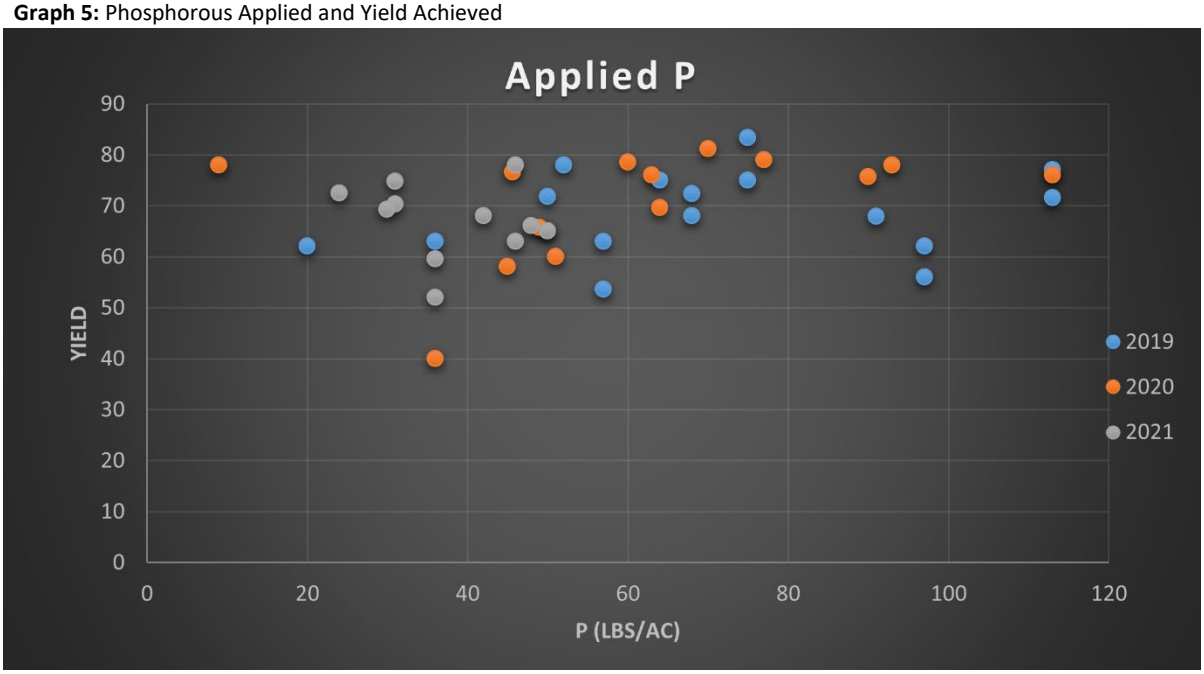
Graph 4: Nitrogen Applied and Yield Achieved



3. Total Phosphorous Applied

The most common practice is split applications with seed safe rates applied with the seed and remainder sideband/ midrow or broadcast. The broadcasting was applied prior to seeding so that the process of seeding would then incorporate the P, resulting in better soil contact. See Graph 5 for applied amounts and corresponding yield, the average amount of P seed placed was 16 lbs., the seed safe recommendation is up to 20 lbs. The key methods of P application seed placed and midrow/sideband. There were a couple of instances of P being broadcast prior to seeding and incorporated with the seeding equipment but this practice is not recommended because P is not mobile in the soil.

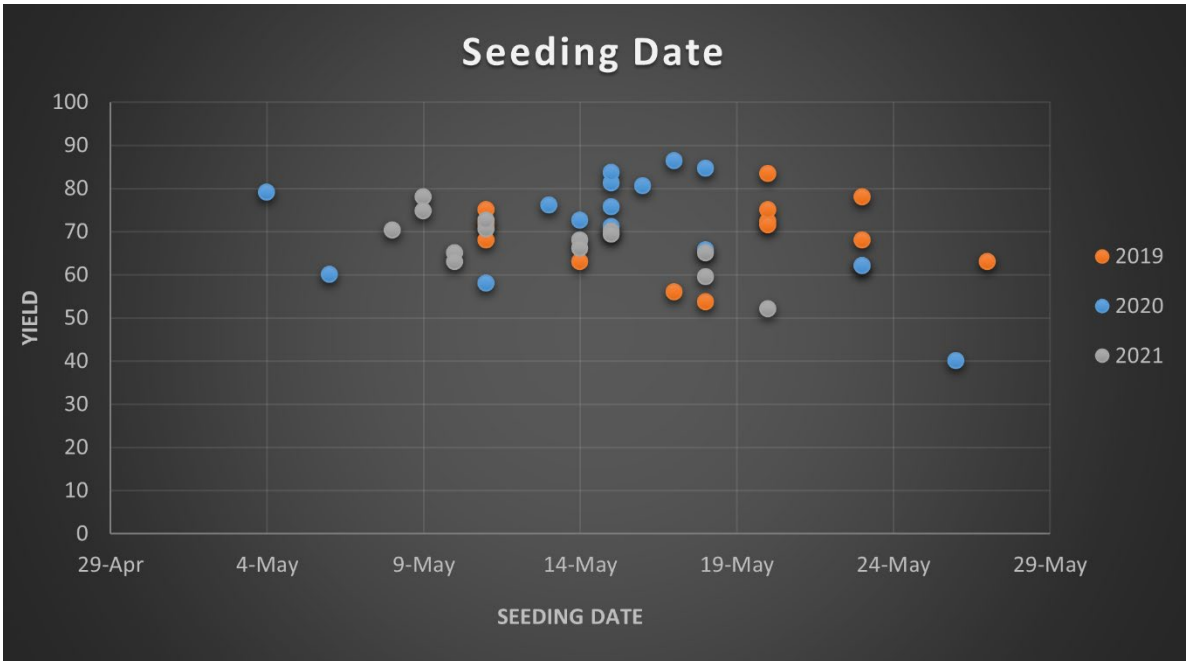
Graph 5: Phosphorous Applied and Yield Achieved



Some sulfur was applied by producers as it was part of the fertilizer blend used. There is not usually a big emphasis on applying sulfur under irrigation because irrigation water is an adequate supplier of sulfur. Boron was applied by some producers, and this was in the form of a coating on the fertilizer prills. It seems micronutrients are not a focus of producers but the taking of tissue samples in the growing season would give a producer a picture of what the crop nutrient requirements are at specific crop growth stages and then producers can apply foliar nutrients to maintain a healthy crop and achieve maximum yields.

4. Seeding Date

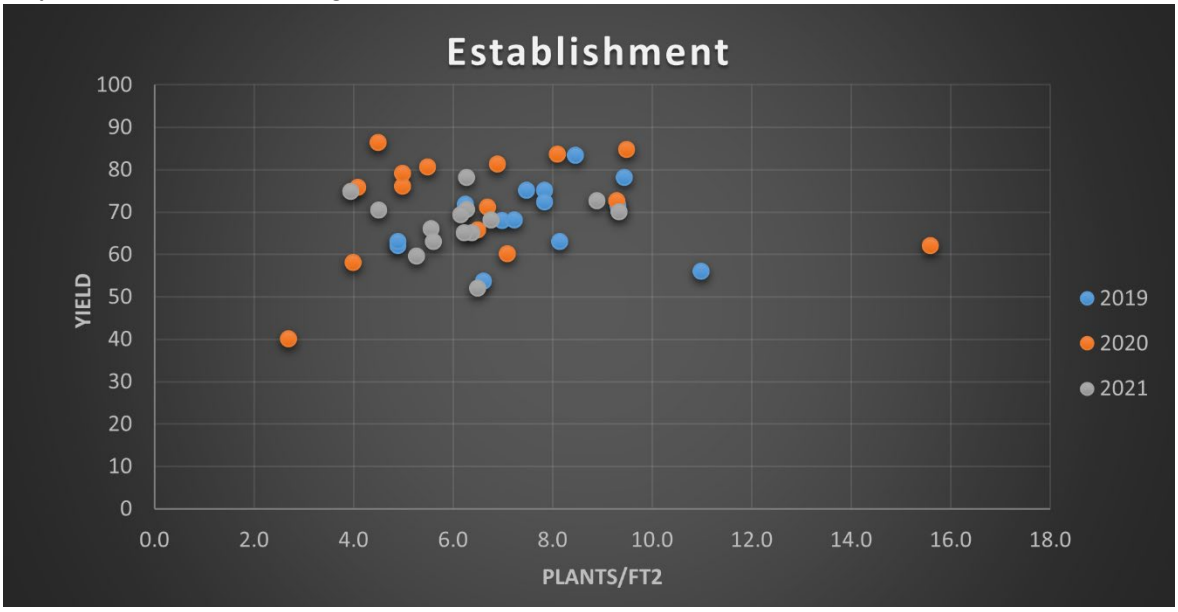
An outcome of the survey showed a correlation between seeding date and yield. Canola seeded after May 15, can show a negative effect on yield. The survey indicates that seeding as late as May 20, results in a 28 per cent yield decrease, see Graph 6. This can be attributed to the crop flowering in the heat of July, resulting in higher risk of heat blasting of the flowers.



5. Establishment

During the growing season a plant stand count was taken for each field in the survey. There was variation in plants/ft^2 due to varying seeding rates and plant genetics. However, this demonstrated that plant stands of ten or greater had a negative impact on yield, while plants stands of four to five plants/ft^2 have the potential to achieve yields of 70+ bu./ac., see Graph 7. In most cases, the average stand was six-eight plants/ft^2 (five-eight plants/ft^2 is the industry recommendation provided by Canola Council of Canada) giving the highest yields of 80-85 bu./ac.

Graph 7: Plants/ft^2 and Correlating Yields



6. Crop Protection

Data was collected on all pesticides used by the participating producers. A variety of practices are utilized for pre-burn from chemical mixes to tillage. The most common form of pre-seed preparation was chemical burn-off with some producers using tillage. Glyphosate is the most common chemical used in burn off. Approximately 80 per cent of canola seeded in the survey is Liberty Link canola. Approximately 56 per cent of these producer's tank mixed an additional herbicide with Liberty, the most common tank mix being Centurion. Those that didn't tank mix tended to go with two applications of Liberty.

Round-up ready varieties were used in the remaining 20 per cent of the fields in the survey. It seems producers are not inclined to use Clearfield varieties.

With irrigation, it is recommended to apply fungicide to a canola crop as previous years of research by ICDC have shown a correlation between fungicide applications and yield response. In the survey 80 per cent of producers used fungicide each year. For the 2020 and 2021 crop years the dry conditions during critical periods (flowering) helped reduce disease pressure. The Ministry of Agriculture conducted the canola disease survey on all 15 fields each year and found low levels of blackleg and sclerotinia. The levels found during the disease survey would have had little effect on yield.

7. Water Usage

Over the course of the survey, the average yield was 69 bu./ac. and the average growing season moisture (both precipitation and irrigation) was 325 mm. In 2019, SSRID had average total moisture (including soil moisture) of 503 mm while the canola crop used 448 mm, RID had total of 517 mm and used 511 mm, LLID had 506 mm and used 504 mm, GID had 493 mm and used 518 mm and the non-district had 580 mm and used 520 mm. All districts in 2019 had adequate moisture and only one district had a field that ended the season with less moisture than the start. 2020 had a similar year as 2019 but this time all districts ended the season with more moisture than the start. The levels were SSRID total of 429 mm used 399 mm, RID total of 433 mm and used 410 mm, LLID total of 457 mm and used 433 mm, GID total 429 mm and used 424 mm and non-district total of 470 mm and used 445 mm. 2021 was a completely different story. With the heat and dryness all districts were unable to maintain the soil moisture. SSRID average total moisture of 422 mm and used 426 mm, RID total 385 mm and used 386 mm, LLID total 352 mm and used 366 mm, GID total 420 mm and used 440 mm and the non-district had an average total of 452 mm and used 462 mm. The highest yield was 83 bu./ac., with a total of 418 mm of moisture, 123 mm of that was actual irrigation. Irrigation management varied considerably from producer to producer. Generally, the highest yields were obtained by producers who maintained soil moisture in the optimal range of 50-100 per cent available moisture. In 2021 no over irrigation occurred due to the heat and dryness, the average applied was 203 mm.

In 2019 and 2020, some irrigators over irrigated resulting in short periods of time when available field moisture exceeded 100 per cent, this results in inefficient use of water as peak water demand of five mm per day had not been reached. The average applied in 2019 was 181 mm and 2020 was

139 mm, see Table 8. It is important to pay close attention to irrigation scheduling to ensure that water is applied according to crop requirements, see Table 9, and is constantly available to the plant, thus improving water use efficiency.

Table 8: Irrigation Applied

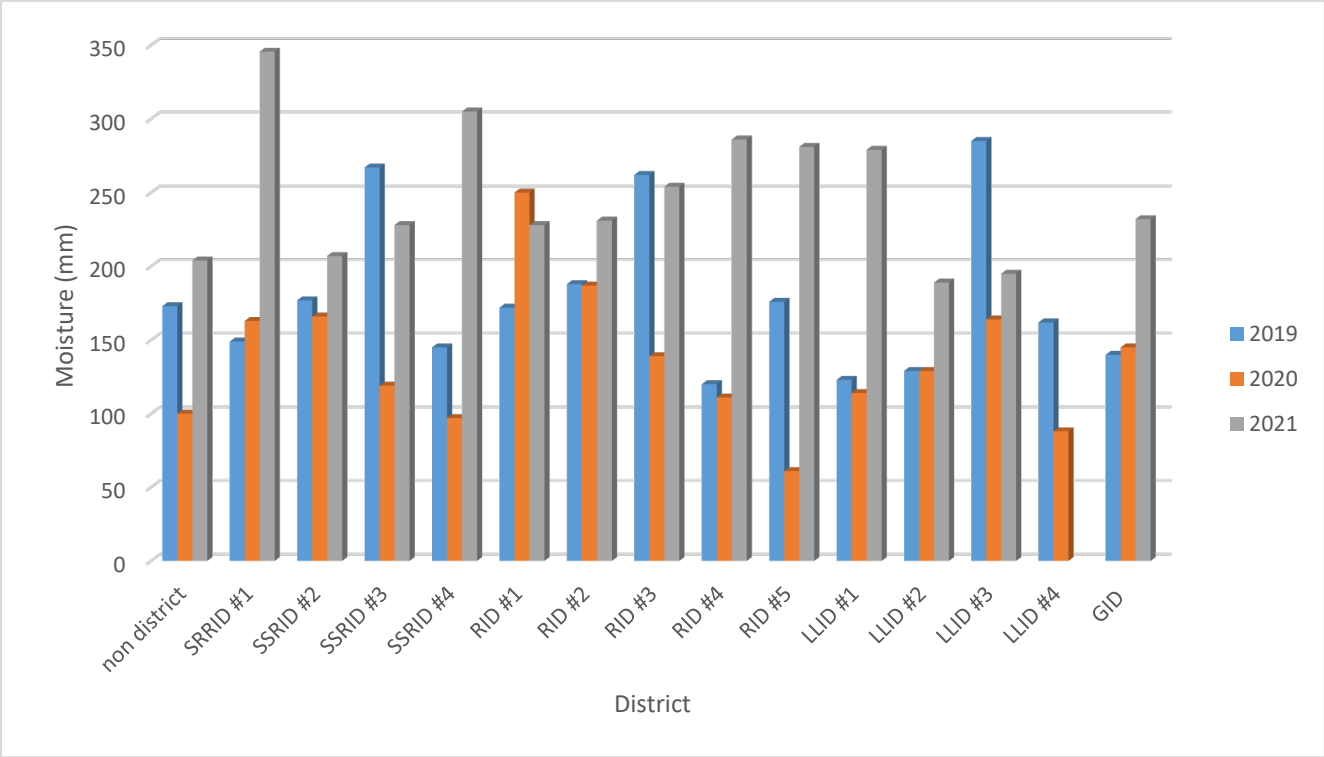
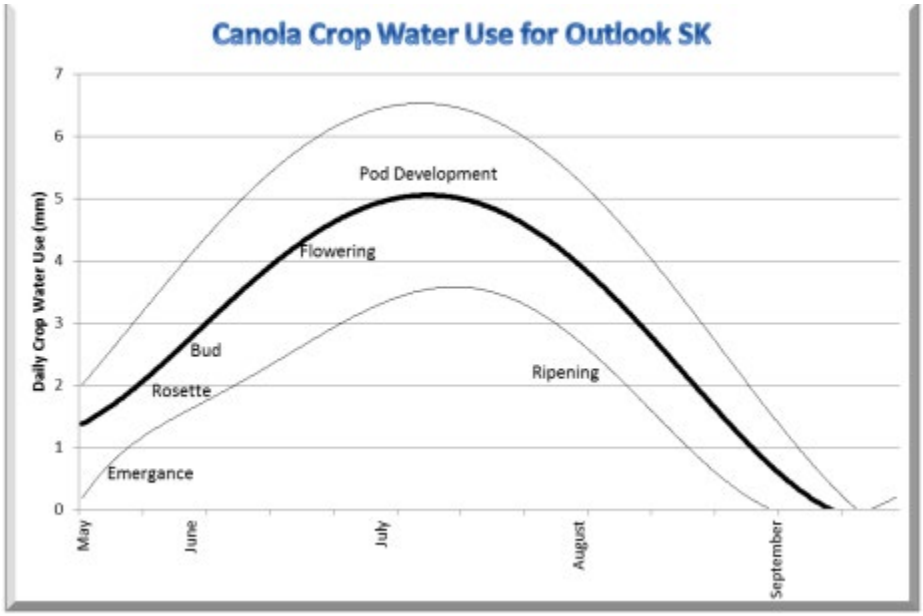


Chart 9: Canola Water Use Chart



8. Harvest Method

The two methods of harvesting canola are swathing or straight cut. In the first year of the survey, swathing was the main method of harvesting; with the crop being pre-cut into windrows and allowed to dry down naturally. As the survey progressed the number of producers opting for straight cutting has increased to a 50/50 split, see Tables 10, 11 and 12. The reason for this has to do with savings in operation costs and an improvement in the yield potential of shatter resistant varieties. Straight cutting reduces the need for and extra piece of equipment, operator and pass in the field.

Table 10: 2019 Harvest methods

District	Harvest date	Harvest Type	Yield
SSRID #1	19-Oct	Swath	72.3
SSRID #2	20-Oct	Swath	53.6
SSRID #3	7-Oct	Swath	71.5
SSRID #4	7-Oct	Swath	71.8
RID # 1	7-Oct	Swath	75
RID #2	Sep 28-Oct 7	Swath	63
RID #3	3-Oct	Straight cut	68
RID #4	18-Oct	Swath	63
RID #5	27-Sep	Straight Cut	67.9
Lucky Lake #1	10-Oct	Swath	83.3
Lucky Lake #2	14-Oct	Straight	78
Lucky Lake #3	18-Oct	Straight	62
Lucky Lake #4	15-Oct	Straight cut	75
GID	14-Sep	Swath	77

Table 11: 2020 Harvest methods

District	Harvest Date	Harvest Type	Yield
SSRID #1	20-Sep	Swathed	86.3*
SSRID #2	12-Sep	Swathed	81.3*
SSRID #3	7-Sep	Swathed	65.7
SSRID #4	9-Sep	Swathed	80.5*
non district	24-Sep	straight	83.6*
RID #1	23-Sep	straight	75.7
GID	5-Sep	Swathed	76
RID #2	18-Sep	straight	79
RID #3	19-Sep	straight	58
RID #4	16-Sep	Swathed	40
LLID #1	13-Sep	Straight	72.5*
LLID #2	18-Sep	Straight	84.6*
LLID #3	25-Sep	Swathed	62
LLID #4	27-Sep	Straight	71
LLID #5	15-Sep	Straight	60

*****Yield adjusted to include hail losses

Table 12: 2021 Harvest methods

District	Harvest Date	Harvest Type	Yield
Lucky Lake #1	8th Sept 2021	Swath	70.5*
Lucky Lake #2	22nd Sept 2021	Straight Cut	65.0
Lucky Lake #3	15th Sept 2021	Swath	68.0
SSRID #1	14th Sept 2021	Swath	72.5
SSRID #2	8th Sept 2021	Swath	65.0*
SSRID #3	17th Sept 2021	Swath	59.5
SSRID #4	18th Sept 2021	Swath	70.0
Non-District	19th Sept 2021	Straight Cut	66.0
GID	17th Sept 2021	Straight Cut	78.0
RID #1	10th Sept 2021	Straight Cut	70.3
RID #2	13th Sept 2021	Straight Cut	74.7
RID #3	17th Sept 2021	Straight Cut	63.0
RID #4	15th Sept 2021	Straight Cut	69.3
RID #5	12th Sept 2021	Swath	52.0

*****Yield adjusted to include hail losses

Conclusion

This survey has looked at all aspects of irrigated canola production and has highlighted the eight most influential management practices.

Water usage is a key factor in obtaining higher yields. To be as efficient as possible with an irrigation system, irrigation scheduling is essential to maintain soil available water between 50-100 per cent and to apply the correct quantities at the correct crop stage. Variety of canola grown has a large impact on yield. The genetics of some varieties exceeds others considerably regarding the data collected in this survey. Selecting the correct variety to achieve the desired yield expectations is a very important decision. This will dictate the results of the producers efforts for the growing season.

Nitrogen is an important nutrient and is required in large quantities to ensure the canola crop can grow to its full potential. The best method of achieving this is through split applications, with nitrogen applied by banding or broadcast in fall and spring prior to seeding and top dressing or fertigation. Therefore, irrigators should be strongly focused on the 4R practices of nutrient planning. Phosphorous is important for canola plants, as it is key in energy transfer in growing plants. If phosphorous is in short supply energy cannot be transferred to building plant tissues resulting in restricted plant growth and thus effecting yield.

Plant stands are important, and the three years of data indicated that stands of six-eight plants/ft^2 resulted in the highest yields.

Crop protection is an essential practice all irrigators should practice. ICDC has carried out numerous research trials in previous years and has shown a strong link between fungicide applications and yield response. The survey also showed that even with the drought conditions of 2021, disease was still present to some extent.

There are two methods of harvest in relation to canola, swath and straight cut. In the first year of the survey most producers swathed their canola for harvest. However, in the final year of that trend had changed in favor of straight cutting.

Seeding date emerged to have a significant effect on yield. Canola seeded after May 20, resulted in a 29 per cent reduction in yield compared with crops sown by May 15. Early seeding has its risks too, if the newly emerged crop gets a spring frost it can kill off the crop. Canola seed can survive in cool soils and seeding can start at soil temperatures of five C. Try and seed canola late enough to avoid the last frost of spring but early enough so that majority of flowering does not occur during the high heat (30 C+) of July.