Strategic Field Program (SFP)
Project Progress Report

Completed reports must be returned by email to Evaluation.Coordinator@gov.sk.ca

Project Title: Evaluating the fertility package of newly available Oat Milling Varieties in SK

SFP File Number: SFP 20240985

Reporting Period: April 1, 2025 to February 16, 2026

Principal Investigator

Full Name: Matthew Struthers

Organization: Crops and Irrigation Branch

Mailing Address: 3085 Albert Street Regina, SK

Phone Number: 306-787-4664

E-mail: Matt.struthers@gov.sk.ca

Collaborators and Co-Investigators *(add additional lines as needed)*

Name	Organization	Mailing Address	Phone Number	Email
Brianne McInnes	Northeast Agriculture Research Foundation	Box 1240, Melfort, SK S0E 1A0	306-920-9393	Brianne.mcinnes@neag.ca
Chris Holzapfel	Indian Head Agricultural Research Foundation	Box 156, Indian Head, SK, S0G 2K0	306-695-7761	cholzapfel@iharf.ca
Mike Hall	East Central Research Foundation	Box 1939, Yorkton, SK, S3N 3X3	306-621-6032	m.hall@suncrestcollege.ca
Jessica Enns	Western Applied Research Corporation	Box 89, Scott, SK, S0K 4A0	306-361-8703	Jessica.enns@warc.ca

Abstract *(no more than 250 words)*

Describe in lay language the progress towards the project objectives over the last reporting period. Include any key findings and any interim conclusions. Include any deviations from the original methodology.

A small-plot randomized trial with four replicates was conducted at four locations in Saskatchewan to evaluate the response of new oat milling varieties to increased nitrogen (N) supply. The locations were Melfort (NARF), Indian Head (IHARF), Yorkton (ECRF), and Scott (WARC). The varieties were CS Camden (check), CDC Anson (new) and AAC Neville (new). The N rates were 80, 100, 120, 140 and 160 kg/ha of soil and applied N. Plant density, crop height, lodging, grain yield, and grain quality were evaluated. CDC Anson had greater plant stands, while increasing N sometimes decreased stands. Camden had the greatest height, while CDC Anson was the shortest, and increasing N increased height 50% of the time. Crop lodging was low overall, and varietal results were inconsistent across sites, but increasing N did increase lodging 25% of the time. CDC Anson and AAC Neville were greater yielding than CS Camden 50% of the time, and increasing N increased yield 75% of the time, but the response was quadratic at one location, where yield significantly decreased beyond 140 kg/ha of N. AAC Neville had greater test weights, and increasing N decreased test weights 50% of the time. For milling quality, β-glucan and protein tended to increase with greater N, while CDC Anson had a better groat percentage. There were significant interactions of variety and N rate for height, yield, and test weight; however, results were often variable across sites. Overall, varieties often responded similarly to N rates, where significant responses beyond moderate to high rates (120-140 kg of N/ha) rarely occurred.

Introduction *(maximum 1,500 words)*

Provide a brief project background and rationale.

The proposed demonstration project intended to compare a commonly grown oat milling variety CS Camden to two newly available oat varieties, that were available for commercial production in the 2025 growing season, CDC Anson and AAC Neville.

CDC Anson is a relatively new variety that began breeder seed production in 2022. The specifications for this variety rate it as 9.3cm shorter, with VG lodging, +3 days for maturity, and 106% yield of Camden. These attributes make it a potential replacement for the commonly grown Arborg oat that offers the same yield advantage over CS Camden and is the second most commonly grown oat variety according to 2022 SCIC insured acres. Arborg is a very tall variety that produces a lot of residue, and with Anson being much shorter in stature, it arguably makes this variety more attractive to producers. CDC Anson also has high beta-glucan content, high % plumps, and excellent groat percentage (> than Summit) making it a very attractive variety for millers.

AAC Neville is a new variety that just entered Breeder Seed production in 2022. This variety was grown by a local (Melfort Area) seed producer for the first time in the 2023 season. According to the producer, they have been using Morgan for many years, but have not been able to find a variety that out-performs it (Personal communication). Morgan has a lot of straw (tall variety) and AAC Neville was the first variety they have tried in a long time that has been promising as a replacement for it, as it is a shorter variety (less straw for residue management) and has had great yields. Morgan is a variety that is over 20 years old, and is still considered an 'acceptable' milling variety on Grain Millers recommendation list, but is not on the recommended varieties (Recommended-Variety-List-Canada-20201.pdf (grainmillers.com). AAC Neville is a Secan variety that is yellow hulled, yields 109% of Summit (similar to CS Camden & Morgan), is 4cm shorter than Summit and 6cm shorter than CS Camden, has excellent lodging resistance, low % thins, high % plumps, and a good test weight (information provided by Secan). The variety is deemed to be a good replacement variety for areas where Summit is commonly grown.

New oat varieties with improved traits and characteristics often respond to a higher level of fertility as compared to older varieties with lower yield potential. With many new oat varieties available for commercial production in recent and coming years, comparing the fertility response of 'tried and true' varieties to new varieties is a great way to encourage producer adoption. Additionally, the demonstration will aid producers in making decisions on suitable

nitrogen rates when adopting new varieties with greater yield potential. This will enable producers to achieve this higher yield potential while also understanding the risks of applying higher N rates in oats, such as crop lodging and lower test weights.

Objectives and Progress *(add additional lines as needed)*

Please list the original objectives and/or revised objectives if ministry-approved revisions have been made to original objectives. A justification is needed for any deviation from original objectives.

Objective	**Progress** *(i.e., completed/in progress)*
To demonstrate suitable nitrogen rates for new oat varieties with higher yield potential in different soil and climatic zones within the province	In progress
To demonstrate to local oat growers the new varieties that are available to increase the adoption of new oat genetics	In progress

Project Changes *(400 words or less)*

Briefly explain any new challenges faced during the reporting period and the impact on the work plan or the budget.

No challenges were faced in the reporting period that impacted the work plan or budget. The trial was successfully established at all locations, without any deviations from the original protocol. All in-field data was collected, and the trial was successfully harvested, with grain samples sent off for further quality analysis at all locations.

Methodology *(maximum of five pages)*

Specify project activities undertaken during this reporting period. Include approaches, experimental design, tests, materials, sites, etc. Please note that any significant changes from the original work plan will require written approval from the ministry.

The demonstration was conducted in 2025 at four Agri-ARM sites in Saskatchewan - Melfort (NARF) in northeast SK, Yorkton (ECRF) in east-central SK, Indian Head (IHARF) in southeast SK, and Scott (WARC) in northwest SK. Scott was the only site in the dark brown soil zone, with the remaining sites located within the black soil zone. These locations were selected to allow us to demonstrate responses across a wide range of environmental conditions.

The demonstration was set up as a factorial combination with treatments arranged in a randomized complete block design with four replications at all locations. The factorial combination consisted of two factors – oat variety (CS Camden, CDC Anson, AAC Neville) and nitrogen rate (80, 100, 120, 140 and 160 kg N/ha) (

Table *1*). The seeding rates for each variety considered both percent germination and thousand seed weights (g/1000 seeds) and were adjusted to target 350 seeds/m². Nitrogen was adjusted based on fall 2024 or spring 2025 soil residual levels of N from a 0 to 24-inch soil depth. Urea was side-band during seeding to meet the target N rates while adjusting for soil residual levels.

Table 1. Treatments used in Evaluating the fertility package of newly available Oat Milling Varieties in SK at Melfort, Yorkton, Scott, and Indian Head, SK in 2025.

Treatment #	Oat Variety	N rate (soil + applied)
1	Camden	80kg
2		100kg
3		120kg
4		140kg
5		160kg
6	CDC Anson	80kg
7		100kg
8		120kg
9		140kg
10		160kg
11	AAC Neville	80kg
12		100kg
13		120kg
14		140kg
15		160kg

Seeding equipment and crop management varied by location (Table 2). Weeds, insects, and disease were controlled using registered products with the specific products at each participating site varying at the discretion of the site managers. All fertility, aside from nitrogen was applied as per soil recommendations for each site to be non-yield-limiting. Desiccants were not used and all plots were harvested using plots combines around the end of August to the end of September. Details on the order of operations at each location are provided in

Table *2* below.

Table 2. Agronomic information and dates of operation for Evaluating the fertility package of newly available oat milling varieties in SK at Melfort, Yorkton, Indian Head and Scott, SK in 2025.

Factor/Field Operation	Scott	Yorkton	Indian Head	Melfort
Pre-emergent Herbicide	Glyphosate 540 1L/ac & AIM 35mL/ac May 13	RoundUp Transorb 1L/ac May 22	RoundUp Weather Max 0.67L/ac May 13	Heat LQ 21mL/ac & StartUp 0.67L/ac May 15
Stubble	Canola	Canola	Canola	Canola
Row Spacing (cm)	25cm	30cm	30cm	30cm
Plot size (m^2)	12.2m^2	30.6m^2	25.6m^2	16.5m^2
Seed date	13-May	29-May	12-May	14-May
Kg P2O5- K20-S/ha (N as per treatment)	15-0-5	29-17-0	40-10-10	56-11-6
in-crop herbicide	Buctril M 0.4L/ac June 16	Prestige XL 900mL/ac June 16	Buctril M 0.405L/ac June 11	Momentum 0.45L/ac & MCPA 600 Ester 0.38L/ac June 20
Plant counts	02-Jun	11-Jun	05-Jun	30-May
Height	07-Aug	August 13 & 15	31-Jul	12-Aug
Lodging	18-Aug	22-Sep	14-Aug	11-Sep
Insecticide	None	None	None	None
Fungicide	Caramba 400mL/ac July 9	None	Trivapro A 0.4L/ac & Trivapro B 0.12L/ac July 2	None

Desiccant	None	None	None	None
Harvest date	04-Sep	25-Sep	26-Aug	11-Sep

Data collection at all sites consisted of soil sampling, plant density, crop height, lodging, grain yield, test weight and milling quality. Soil samples were taken in the spring for the general trial area from 0 to 6-inch (0-15cm) depths and 6 to 24-inch (15-60cm) depths from the trial area. Residual N from 0-24-inches was used to adjust for total N at seeding time. Soil sample results at each location are provided in Table 12 of the appendices. Plant density was measured by counting the seedlings along two 1-meter sections of crop row per plot. Crop height was determined by measuring the height of six different plants in six different locations to the nearest centimetre in every plot. Lodging was determined by rating every plot for severity of lodging prior to harvest. A scale of 0 to 9 was used, where 0 implied no lodging, and 9 implied that the whole plot was lying flat. Grain yield was determined at each site by weighing each harvested plot sample and converting the grams per plot to a kg/ha equivalent, while correcting to a consistent moisture of 13.5%. Test weight was determined by weighing the grams of seed in a 0.5L for every harvested plot sample. Composites per treatment were sent from each location to Grain Millers for milling quality. Lastly, statistical analyses were completed for each site separately using the Statistix 10 software.

Results *(maximum of 20 pages (not including figures or tables))*

Describe project accomplishments during the reporting period under relevant objectives listed under "Objectives and Progress" section. Please accompany written description of results with tables, graphs and/or other illustrations. Provide discussion necessary to the full understanding of the results. Where applicable, results should be discussed in the context of existing knowledge and relevant literature. Detail any major concerns or project setbacks.

Environmental Conditions

The environmental conditions of 2025 were marked by dry to relatively normal precipitation (55-104% of long-term average) at all sites with near normal to slightly higher average growing season temperatures (+0.1-1.0°C) (Table 3). All sites experienced below-average rainfall in May, with much higher average temperatures. The northern locations of Scott and Melfort were the driest locations in May, only receiving total precipitation of 12mm and 5mm, respectively. The more southern sites of Yorkton and Indian Head experienced greater amounts of precipitation in comparison, of 24mm and 43mm, respectively, although these amounts were still below their long-term averages. In June, most sites had near-normal temperatures, with below-average precipitation at Yorkton and Indian Head, and above average precipitation at Scott and Melfort. July was cooler, with reduced precipitation at all locations, while August was much warmer with greater precipitation, except for at Indian Head. Overall, conditions were good for oat growth and yield, although drier spring conditions may have limited the likelihood of N responses.

Table 3. Total precipitation (mm) and average temperatures (°C) from May through August of 2025 as compared to their respective long-term averages at Melfort, Yorkton, Scott and Indian Head, SK.

	May	June	July	August	Average/Total
--Temperature(°C)--					
Yorkton	12.4	15.7	17.5	18.3	16.0
Long-Term	10.4	15.5	17.9	17.1	15.2
Scott	12.9	14.6	15.8	17.4	15.2
Long-term	10.8	14.8	17.3	16.3	14.8
Melfort	13.8	15.0	17.0	18.0	16.0
Long-term	10.1	15.2	17.8	16.7	15.0
Indian Head	12.7	15.3	17.0	17.8	15.7
Long-term	10.8	15.8	18.2	17.4	15.6
--Precipitation(mm)--					
Yorkton	23.6	63.4	36.8	71.2	195.0 (72%)
Long-Term	51.0	80.0	78.0	62.0	272.0
Scott	11.8	103.7	28.7	64.5	208.7 (92%)
Long-term	38.9	69.7	69.4	48.7	226.7
Melfort	4.8	93.2	25.9	113.5	237.4 (104%)
Long-term	33.4	79.5	69.6	45.9	228.4
Indian Head	42.6	39.4	27.1	26.9	136.0 (55%)
Long-term	51.7	77.4	63.8	51.2	244.1

Plant density (plants/m²)

Plant density was greatest at Yorkton (269 plants/m²), followed by Indian Head (268 plants/m²), Scott (242 plants/m²), and Melfort (140 plants/m²) (Table 4). Plant density was only significantly different for variety at Melfort ($p<0.0001$), Scott ($p=0.01$), and Indian Head ($p<0.0001$). At all three locations, CDC Anson had the greatest plant density that was significantly greater than both CS Camden and AAC Neville. Plant density was also significantly different for N rate at Melfort ($p=0.01$) and Scott ($p<0.0001$). At both locations, increasing N rate significantly decreased oat stands, however at Scott, stands were significantly reduced from 100 to 120kg/ha, but were not significantly reduced beyond 120 kg/ha, while at Melfort, stands were only significantly reduced at 160 kg/ha as compared to lower rates. There were no significant interactions of variety and N rate for plant density at any location.

Table 4. Results of the Analysis of Variance and treatment means variety and N rate for plant density (plants/m²) in Evaluating the fertility package of newly available Oat Milling Varieties in SK in 2025 at Melfort, Scott, Yorkton, and Indian Head, SK. Letters signify treatments that are significantly different at $p<0.05$ using Tukey's HSD.

Plant Density (plants/m²)								
	Melfort		**Scott**		**Yorkton**		**Indian Head**	
Variety	<0.0001		0.0138		0.079		<0.0001	
N Rate	0.0119		<0.0001		0.6264		0.7314	
Grand Mean	140		242		269		268	
CV	19.27		0.93		12.24		8.59	
Variety								
Camden	130	B	251	B	255	A	249	B
Anson	172	A	262	A	279	A	290	A
Neville	119	B	252	B	272	A	264	B
N rate								
80kg	150	A	273	A	256	A	268	A
100kg	146	A	265	A	270	A	260	A
120kg	144	AB	250	B	277	A	270	A
140kg	148	A	248	B	271	A	272	A
160kg	114	B	240	B	270	A	270	A

Crop Height (cm)

Crop height was greatest at Yorkton (85cm), followed by Scott (80cm), Melfort (79cm), and Indian Head (76cm) (Table 5). Crop height was significantly different between varieties at all sites ($p<0.0001$). The difference in height between varieties was similar across all locations, with CS Camden being the tallest variety, which was significantly taller than both CDC Anson and AAC Neville. Furthermore, AAC Neville was also significantly taller than CDC Anson, making CDC Anson the shortest variety overall. Crop height was also significantly affected by N rate at Scott ($p<0.0001$) and Yorkton ($p=0.01$). At Scott, height was significantly increased as N rate increased, but not beyond 100 kg/ha of N. At Yorkton, height was significantly increased from 120 kg/ha of N as compared to 80 kg/ha of N, but was not significantly increased beyond this rate.

Table 5. Results of the Analysis of Variance and treatment means for variety and N rate for crop height (cm) in Evaluating the fertility package of newly available Oat Milling Varieties in SK in 2025 at Melfort, Scott, Yorkton, and Indian Head, SK. Letters signify treatments that are significantly different at $p<0.05$ using Tukey's HSD.

Crop Height (cm)								
	Melfort		**Scott**		**Yorkton**		**Indian Head**	
Variety	<0.0001		<0.0001		<0.0001		<0.0001	
N Rate	0.0916		<0.0001		0.0141		0.5129	
Grand Mean	79		80		85		76	
CV	6.77		2.61		5.19		3.42	
Variety								
Camden	87	A	87	A	92	A	79	A
Anson	72	C	74	C	78	C	71	C
Neville	78	B	79	B	83	B	77	B
N rate								
80kg	81	A	76	B	81	B	75	A
100kg	76	A	81	A	83	AB	76	A
120kg	80	A	81	A	87	A	76	A
140kg	78	A	81	A	85	AB	76	A
160kg	82	A	81	A	86	AB	76	A

Lastly, Scott (p=0.03) was the only site where an interaction of variety and N rate significantly affected crop height (Table 6). At this location, both CDC Anson and AAC Neville had similar height, but only when CDC Anson received 100 kg/ha or more of N. Furthermore, AAC Neville also had comparable height to CS Camden, but only when AAC Neville received higher levels of N (100 kg/ha or greater) and CS Camden had low N (80 kg/ha).

Table 6. Results of the Analysis of Variance for the interaction of variety and N rate on crop height (cm) in Evaluating the fertility package of newly available Oat Milling Varieties in SK in 2025 at Melfort, Scott, Yorkton, and Indian Head, SK. Letters signify treatments that are significantly different at p<0.05 using Tukey's HSD.

Crop Height (cm)								
	Melfort		**Scott**		**Yorkton**		**Indian Head**	
P-value	0.5623		0.0324		0.9302		0.6508	
Treatment Means								
Camden 80kg	87	ABC	84	BCD	88	ABCDE	79	AB
Camden 100kg	82	ABCD	85	ABC	92	ABCD	79	AB
Camden 120kg	90	AB	88	AB	94	AB	79	AB
Camden 140kg	87	ABC	89	A	93	ABC	79	AB
Camden 160kg	90	A	87	AB	95	A	80	A
Anson 80kg	74	CD	70	G	74	F	70	EF
Anson 100kg	69	D	75	F	77	EF	71	CDEF
Anson 120kg	73	D	76	F	82	DEF	71	DEF
Anson 140kg	69	D	75	F	81	DEF	73	BCDEF
Anson 160kg	77	ABCD	75	F	79	EF	70	F
Neville 80kg	81	ABCD	76	F	81	DEF	74	ABCDEF
Neville 100kg	76	BCD	82	CDE	81	DEF	77	ABCDE
Neville 120kg	77	ABCD	79	DEF	85	ABCDE	78	AB
Neville 140kg	79	ABCD	78	EF	82	CDEF	77	ABCD
Neville 160kg	77	ABCD	79	DEF	84	BCDEF	78	ABC

Lodging (1-9)

Lodging was greatest at Yorkton (3.7), followed by Indian Head (1.1), Scott (1.0) and Melfort (0.5) (Table 7). Lodging was significantly different between varieties at Melfort (p=0.02) and Indian Head (p=0.0002). At Melfort, AAC Neville (0.1) had the lowest degree of lodging, which was lower than CS Camden (0.7), but only significantly lower than CDC Anson (0.8). Indian Head had an opposing result, where CS Camden (1.0) had the lowest degree of lodging, which was lower than CDC Anson (1.1), but only significantly lower than AAC Neville (1.3). Lodging was also significantly different between N rates at Yorkton (p=0.02) and Indian Head (p=0.0002). At Indian Head, lodging significantly increased at 140 and 160 kg/ha of N as compared to the lower N rates of 80 to 120 kg/ha. At Yorkton, the lodging response to N rate was unexcepted, where 100 kg/ha of N had significantly greater lodging, but only as compared to 160 kg/ha of N. Lodging typically increases with increasing N availability to the crop, so a lower N rate having significantly higher lodging than a high rate is an unexpected result. The reason for this result may be due to the subjective nature of lodging ratings and a high CV (58%) at this site. Lastly, there were never any significant interactions of variety and N rate that affected crop lodging at any location.

Table 7. Results of the Analysis of Variance and treatment means for variety and N rate for Lodging (0-9) in Evaluating the fertility package of newly available Oat Milling Varieties in SK in 2025 at Melfort, Scott, Yorkton, and Indian Head, SK. Letters signify treatments that are significantly different at p<0.05 using Tukey's HSD.

Lodging (0-9)								
	Melfort		**Scott**		**Yorkton**		**Indian Head**	
Variety	0.0189		--		0.5088		0.0002	
N Rate	0.1594		--		0.0191		0.0002	
Grand Mean	0.5		1.0		3.7		1.1	
CV	167.62		--		57.89		15.44	
Variety								
Camden	0.7	AB	1.0	A	3.3	A	1.0	B
Anson	0.8	A	1.0	A	4.0	A	1.1	AB
Neville	0.1	B	1.0	A	3.9	A	1.3	A
N rate								
80kg	0.8	A	1.0	A	3.7	AB	1.0	B
100kg	0.8	A	1.0	A	5.3	A	1.0	B
120kg	0.4	A	1.0	A	4.3	AB	1.0	B
140kg	0.3	A	1.0	A	3.0	AB	1.3	A
160kg	0.1	A	1.0	A	2.3	B	1.3	A

Grain Yield (kg/ha)

Grain yield was greatest at Scott (6768 kg/ha), followed by Melfort (5985 kg/ha), Indian Head (5338 kg/ha), and Yorkton (4749 kg/ha) (Table 8). Variety significantly affected yield at Scott (p<0.0001), Yorkton (p=0.0054), and Indian Head (p<0.0001). At Indian Head, AAC Neville was the highest yielding variety, and at Yorkton CDC Anson was the highest yielding. At Scott, AAC Neville and CDC Anson were both significantly higher yielding than CS Camden. At Indian Head, CDC Anson and CS Camden had comparable yields, that were both significantly lower yielding than AAC Neville. At Yorkton, CDC Anson was only significantly greater yielding than AAC Neville, while both varieties were comparable in yield to CS Camden. Grain yield was significantly affected by N rate at Melfort (p=0.0023), Scott (p<0.0001), Yorkton (0.03) and Indian Head (p=0.0001). At Melfort and Indian Head, grain yield increased linearly as N rate increased; however, yield was not significantly increased beyond 120 kg/ha of N. At Scott, yield followed a quadratic trend, where yields were maximized at 140 kg/ha of N; however, yields did significantly decline beyond this rate. At Yorkton, although the yield was significant, Tukey's HSD found no significant pairwise differences among the means. At this location, yield followed a similar trend as to Melfort, where yields were highest at 120 kg/ha of N, but not increased beyond that rate. The overall increase in yield as a result of N rate at Yorkton was quite small overall, suggesting a much smaller response to N rate as compared to the other locations.

Table 8. Results of the Analysis of Variance and treatment means for variety and N rate alone for grain yield (kg/ha) in Evaluating the fertility package of newly available Oat Milling Varieties in SK in 2025 at Melfort, Scott, Yorkton, and Indian Head, SK. Letters signify treatments that are significantly different at p<0.05 using Tukey's HSD.

Grain Yield (kg/ha)								
	Melfort		**Scott**		**Yorkton**		**Indian Head**	
Variety	0.6715		<0.0001		0.0054		<0.0001	
N Rate	0.0023		<0.0001		0.0302		0.0001	
Grand Mean	5985		6768		4749		5338	
CV	7.16		1.76		16.15		3.73	
Variety								
Camden	5921	A	6579	B	4805	AB	5167	B
Anson	6043	A	6852	A	5136	A	5296	B
Neville	5990	A	6872	A	4306	B	5553	A
N rate								
80kg	5620	B	6418	C	4313	A	5108	C
100kg	5827	AB	6840	B	4421	A	5259	BC
120kg	6214	A	6776	B	5179	A	5363	AB
140kg	5974	AB	6982	A	4769	A	5447	AB
160kg	6289	A	6823	B	5064	A	5516	A

At Melfort (p=0.02) and Scott (p<0.0001) there was also a significant interaction of variety and N rate on grain yield (Table 9). At Melfort, grain yield only increased with CS Camden as N rate increased, and CDC Anson and AAC Neville did not demonstrate significant increases in yield as N rate increased. At Scott, CS Camden and CDC Anson had comparable yields at all levels of N, except for 120 kg/ha of N, where CDC Anson had significantly greater yields. At Scott, AAC Neville also had comparable yields to CS Camden at higher rates of N (120-160 kg/ha), but had significantly greater yield when N rates were lower (80 & 100 kg/ha).

Table 9. Results of the Analysis of Variance for the interaction of variety and N rate for Grain Yield (kg/ha) in Evaluating the fertility package of newly available Oat Milling Varieties in SK in 2025 at Melfort, Scott, Yorkton, and Indian Head, SK. Letters signify treatments that are significantly different at p<0.05 using Tukey's HSD.

Grain Yield (kg/ha)								
	Melfort		**Scott**		**Yorkton**		**Indian Head**	
P-value	0.0201		<0.0001		0.982		0.984	
Treatment Means								
Camden 80kg	5210	C	6266	G	4118	A	4950	E
Camden 100kg	5476	BC	6648	DEF	4658	A	5082	DE
Camden 120kg	6397	AB	6311	G	5233	A	5157	BCDE
Camden 140kg	5923	ABC	6956	ABC	4841	A	5315	ABCDE
Camden 160kg	6602	A	6716	CDE	5177	A	5330	ABCDE
Anson 80kg	5941	ABC	6363	FG	4615	A	5112	CDE
Anson 100kg	5927	ABC	6943	ABCD	4731	A	5200	BCDE
Anson 120kg	6267	ABC	7210	A	5593	A	5285	ABCDE
Anson 140kg	5708	ABC	6889	BCDE	5186	A	5409	ABCDE
Anson 160kg	6370	AB	6856	BCDE	5555	A	5474	ABCD
Neville 80kg	5709	ABC	6625	EF	4205	A	5261	ABCDE
Neville 100kg	6079	ABC	6928	ABCDE	3876	A	5495	ABCD
Neville 120kg	5980	ABC	6809	BCDE	4710	A	5646	AB
Neville 140kg	6291	ABC	7100	AB	4281	A	5617	ABC
Neville 160kg	5894	ABC	6898	BCDE	4460	A	5745	A

Test weight (grams/0.5L)

Test weight was greatest at Indian Head (265.8 g/0.5L), followed by Melfort (260.1 g/0.5L), Yorkton (253.1 g/0.5L), and Scott (241.7 g/0.5L). Variety significantly affected test weight at Melfort (p=0.0029), Scott (p<0.0001), and Indian Head (p<0.0001) (Table 10). All three locations demonstrated the same result, where AAC Neville had significantly higher test weights than both CS Camden and CDC Anson. Additionally, CS Camden and CDC Anson were not significantly different from one another. N rate also significantly affected test weight at Melfort (p=0.02) and Scott (p=0.0018). At both locations, test weight decreased as the N rate increased. At Melfort, test weight was only significantly decreased at 160 kg/ha of N as compared to 80 kg/ha of N. At Scott, test weight only began to decrease beyond 120 kg/ha of N, which was significantly reduced at 160 kg/ha of N in comparison.

Table 10. Results of the Analysis of Variance and treatment means for variety and N rate alone for test weight (g/0.5L) in Evaluating the fertility package of newly available Oat Milling Varieties in SK in 2025 at Melfort, Scott, Yorkton, and Indian Head, SK. Letters signify treatments that are significantly different at p<0.05 using Tukey's HSD.

Test weight (g/0.5L)								
	Melfort		**Scott**		**Yorkton**		**Indian Head**	
Variety	0.0029		<0.0001		0.5756		<0.0001	
N Rate	0.0202		0.0018		0.1382		0.9589	
Grand Mean	260.1		241.7		253.1		265.8	
CV	0.92		0.93		1.51		1.26	
Variety								
Camden	259.3	B	241.4	B	252.7	A	263.6	B
Anson	259.3	B	239.9	B	253.9	A	263.2	B
Neville	261.7	A	243.7	A	252.8	A	270.5	A
N rate								
80kg	261.6	A	242.9	A	255.1	A	265.6	A
100kg	260.3	AB	242.5	A	252.5	A	266.1	A
120kg	260.9	AB	242.1	A	254.2	A	265.9	A
140kg	259.0	AB	241.5	AB	252.6	A	266.1	A
160kg	258.6	B	239.2	B	251.3	A	265.2	A

There was also a significant interaction of variety and N rate for test weight at Melfort (p=0.04) (Table 11). At Melfort, test weight was not significantly reduced as N rate increased for CS Camden or CDC Anson, but was for AAC Neville. AAC Neville had significantly reduced test weight at the highest rate of N (160 kg/ha) as compared to the lowest rate of N (80 kg/ha).

Table 11. Results of the Analysis of Variance for the interaction of variety and N rate for test weight (g/0.5L) in Evaluating the fertility package of newly available Oat Milling Varieties in SK in 2025 at Melfort, Scott, Yorkton, and Indian Head, SK. Letters signify treatments that are significantly different at p<0.05 using Tukey's HSD.

Test weight (g/0.5L)								
	Melfort		**Scott**		**Yorkton**		**Indian Head**	
p-value	0.0427		0.0736		0.5777		0.7617	
Treatment Means								
Camden 80kg	258.2	B	241.8	A	253.5	A	263.8	BC
Camden 100kg	260.4	AB	242.1	A	251.3	A	263.3	BC
Camden 120kg	260.0	AB	241.1	A	253.2	A	263.3	BC
Camden 140kg	259.0	B	241.3	A	254.5	A	264.9	ABC
Camden 160kg	258.9	B	240.6	A	251.2	A	262.5	BC
Anson 80kg	261.0	AB	243.0	A	255.9	A	263.1	BC
Anson 100kg	259.2	B	241.7	A	254.5	A	263.9	BC
Anson 120kg	259.9	AB	240.2	AB	253.8	A	261.5	C
Anson 140kg	256.9	B	240.1	AB	251.5	A	263.9	BC
Anson 160kg	259.3	B	234.7	B	253.6	A	263.8	BC
Neville 80kg	265.5	A	244.0	A	256.0	A	270.0	ABC
Neville 100kg	261.4	AB	243.6	A	251.5	A	271.0	AB
Neville 120kg	262.8	AB	245.1	A	255.6	A	272.8	A
Neville 140kg	261.2	AB	243.3	A	251.8	A	269.6	ABC
Neville 160kg	257.6	B	242.3	A	249.3	A	269.2	ABC

Milling quality:

Results of milling quality are provided in Tables 15 to 18 of the Appendices. Milling quality could not be statistically analyzed across treatments because only one composite sample per treatment was submitted for each site, but general trends can be deduced from the results. The Prairie Grain Development Committee (PGDC) for Oat and Barley guidelines for food grade oat was used to evaluate thins, groat yield, protein and β-glucan. The Canadian Grain Commissions (CGC) standards for exporting Canadian Western (CW) oats was used to analyze other oat parameters that were not included in the PGDC guidelines for food grade, including: dockage, wild oats, wheat, barley, other grains, dehulls, darks, brokens, frost damage, and sprouted. According to the PGDC, oat must have >80% plumpness, <2% thins, 75% groats, >13% protein and >4.8% β-glucan to meet food grade oat specifications. Based on these parameters all samples made food grade at Melfort, except for CS Camden at 80 kg of N/ha for β-glucan (4.65), and CS Camden and AAC Neville for groat yield (70-74.3%). Scott had a similar result where all treatments made food grade for PGDC guidelines, except for CS Camden and AAC Neville for groat yield (62.5-73.3%), and CDC Anson at 80 kg of N/ha for groat yield (74.9%). At Yorkton, all treatments had thins <2%; however, groat yield tended to only make food grade for CDC Anson, and % protein for higher N rates for all varieties, where 100-140 kg/ha of N was needed to make protein >13% depending on the variety. Furthermore, β-glucan was above 4.8% for all treatments, except CS Camden and CDC Anson at low levels of N (80 kg/ha). At Indian Head, groat yield was below food grade for all treatments (68.9-74.4%), while protein was well above food grade (13.9-17.3%). β-glucan was also well above food grade for all treatments except for CDC Anson at a low N rate (4.77%). Indian Head was the only location to demonstrate % thins > 2% for many treatments, which appeared to occur randomly, and not directly as a result of variety or N rate, although when thins was lower (<2%) it tended to be for higher N rates (100 kg of N /ha or more) as opposed to lower N rates (80 kg of N/ha). At this site, percentage thins ranged from 1.3 to 3.3%. Based on CGC guidelines, it can be concluded that contamination by other grains was very low at all sites, with dockage, wild oats, wheat, barley, and all other grains ranging from 0-1.1%, which was well below the CGC standards to make the top grade of oats with <2% contamination by other grains. All sites also had no green oats or frost damage, while only Yorkton had sprouted kernels (0-5.9%) in the harvested samples. All sites had less than 10% dehulls and 1.2% or less darks, which would make top oat grades for CGC standards. Lastly, broken or damaged kernels was around 3% or less at all locations, which would make top oat grades. Overall, milling quality tended to be more impacted by location than treatment, but protein and sometimes β-glucan tended to increase at higher rates of N, while groat yield tended to be higher for CDC Anson, and lower for CS Camden and AAC Neville.

Interim Conclusions

Describe the interim conclusions.

When variety was significant, CDC Anson tended to have greater plant stands, was shorter in stature and had higher yields 50% of the time, and comparable test weights to the check variety. AAC Neville tended to have lower lodging at one location, higher yields 50% of the time, and higher test weights at all sites in comparison to the check variety. The check variety of CS Camden tended to have greater height, less lodging at one location, lower or similar yields, and lower or similar test weights in comparison to the newer varieties. When nitrogen significantly affected oats, it decreased stands 50% of the time, increased height 50% of the time, increased lodging 25% of the time, increased yield linearly at 50% of the sites, while having a quadratic effect on yield at 25% of the sites, and decreased test weight 50% of the time. When there was an interaction of variety and N rate, height, yield and test weight were significantly affected. For height, shorter varieties (CDC Anson < AAC Neville < CS Camden) demonstrated comparable height to taller varieties when higher N rates were applied. For yield, at one site, CS Camden was the only variety to demonstrate a significant increase in yield as N rate increased, whereas at another site, CDC Anson was only higher yielding than CS Camden at 120 kg/ha of N, and AAC Neville was only significantly higher yielding than CS Camden at lower rates of N (80 & 100 kg/ha). For test weight, at one location, AAC Neville was the only variety to demonstrate a significant reduction in test weight as compared to the other varieties. Lastly, milling quality tended to be more impacted by location than treatment, but protein and sometimes β-glucan tended to increase at higher rates of N, while groat yield tended to be higher for CDC Anson, and lower for CS Camden and AAC Neville. Overall, based on the results of 2025, the new varieties, CDC Anson and AAC Neville, were not consistently more responsive to N than CS Camden, but did

demonstrate similar attributes as to their varietal traits, such as shorter statures and greater yields, while AAC Neville had greater test weights, and CDC Anson often had greater groat percentage.

Knowledge Transfer Activities

List any knowledge transfer activities undertaken in relation to this project. Include presentations, talks, papers published in science journals or other magazines etc.

The trial was passed by with funder and treatment signage at the NARF & AAFC Joint Annual Field tour at Melfort, SK on July 23rd, 2025 to 126 attendees. The trial was presented at the Indian Head Crop Management Field Day July 15, 2025 to 157 and the BASF Global Herbicide Group IHARF plot tour July 16, 2025 to 26 people by Chris Holzapfel. Results were shared at the 2025 POGA Conference by Jessica Enns of WARC to approx. 150 people. Results were also shared at the SaskOats AGM in 2025 by Jessica Enns of WARC to 20 people. A Top Crop Manager Magazine article is coming out in mid-March 2026 regarding the results of the trial at WARC (unknown title).

Contributions and Support

Identify any changes expected to industry contributions, in-kind support, collaborations or other resources.

There have been no changes in in-kind support or collaborations to date. We would like to continue to thank the Strategic Field Program, Saskatchewan Oat Development Commission, and Grain Millers Canada for their financial contributions to the project, as well as NARF, WARC, IHARF, and ECRF staff for their hard work in completing all aspects of the project to date.

Appendices

Include any additional materials supporting the previous sections, e.g. detailed data tables, maps, graphs, specifications, literature cited (Use a consistent reference style throughout).

Table 12. Soil sample results from the trial area of Evaluating the fertility package of newly available Oat Milling Varieties in SK at Melfort, Yorkton, Scott, and Indian Head, SK in 2025.

Depth	NO3-N (kg/ha)	Olsen-P (ppm)	K (ppm)	S (kg/ha)	pH	Organic Matter (%)	Salts (mmho/cm)
Melfort							
0-15cm	21	10	459	18	6	8.9	0.4
15-60cm	20			27	7.4		0.39
Yorkton							
0-15cm	21	9	260	65	7.8	5.8	0.46
15-30cm	21			135+	7.9		1.59
Scott							
0-15cm	16	17	218	90	5.3	3.5	0.28
15-60cm	17			88	7.7		0.29
Indian Head							
0-15cm	9	9	693	16	7.6	5.4	0.67

15-60cm	10			34	8.1		0.61

Tabel 13. Results of the Analysis of Variance for the interaction of variety and N rate for plant density (plants/m²) in Evaluating the fertility package of newly available Oat Milling Varieties in SK in 2025 at Melfort, Scott, Yorkton, and Indian Head, SK. Letters signify treatments that are significantly different at p<0.05 using Tukey's HSD.

Plant Density (plants/m²)								
	Melfort		**Scott**		**Yorkton**		**Indian Head**	
P-value	0.0988		0.0736		0.7421		0.34	
Treatment Means								
Camden 80kg	157	ABC	273	ABC	237.5	A	241.1	B
Camden 100kg	142	ABCD	260	ABCD	254.3	A	245.2	B
Camden 120kg	123	BCD	247	BCD	275.2	A	252.6	AB
Camden 140kg	144	ABCD	244	CD	262.9	A	256.7	AB
Camden 160kg	85	D	233	D	247.3	A	249.3	AB
Anson 80kg	163	ABC	285	A	265.8	A	307.6	A
Anson 100kg	173	AB	276	AB	290.8	A	276	AB
Anson 120kg	183	AB	257	ABCD	275.6	A	278.5	AB
Anson 140kg	198	A	249	BCD	290.8	A	285.8	AB
Anson 160kg	141	ABCD	245	CD	271.9	A	304.3	A
Neville 80kg	130	ABCD	261	ABCD	265.0	A	255.1	AB
Neville 100kg	122	BCD	259	ABCD	264.2	A	258.4	AB
Neville 120kg	125	BCD	247	BCD	280.2	A	278.5	AB
Neville 140kg	103	CD	250	BCD	258.8	A	274	AB
Neville 160kg	115	BCD	244	CD	291.6	A	255.1	AB

Table 14. Results of the Analysis of Variance for the interaction of variety and N rate for lodging (0-9) in Evaluating the fertility package of newly available Oat Milling Varieties in SK in 2025 at Melfort, Scott, Yorkton, and Indian Head, SK. Letters signify treatments that are significantly different at p<0.05 using Tukey's HSD.

Lodging (0)-9)								
	Melfort		**Scott**		**Yorkton**		**Indian Head**	
p-value	0.8052		--		0.3796		0.0606	
Treatment Means								
Camden 80kg	1.3	A	1.0	A	4.3	A	1.0	B
Camden 100kg	1.3	A	1.0	A	4.8	A	1.0	B
Camden 120kg	0.3	A	1.0	A	3.0	A	1.0	B
Camden 140kg	0.5	A	1.0	A	3.0	A	1.0	B
Camden 160kg	0.0	A	1.0	A	1.3	A	1.0	B
Anson 80kg	1.0	A	1.0	A	2.0	A	1.0	B
Anson 100kg	1.0	A	1.0	A	5.5	A	1.0	B
Anson 120kg	1.0	A	1.0	A	6.0	A	1.0	B
Anson 140kg	0.5	A	1.0	A	3.3	A	1.4	AB
Anson 160kg	0.3	A	1.0	A	3.3	A	1.3	AB
Neville 80kg	0.3	A	1.0	A	4.8	A	1.0	B
Neville 100kg	0.0	A	1.0	A	5.5	A	1.1	AB
Neville 120kg	0.0	A	1.0	A	3.8	A	1.1	AB
Neville 140kg	0.0	A	1.0	A	2.8	A	1.5	A
Neville 160kg	0.0	A	1.0	A	2.5	A	1.5	A

Table 15. Results of Milling Analysis completed by Grain Millers for Evaluating the fertility package of newly available Oat Milling Varieties in SK in 2025 at NARF.

Site	TRT no	Dockage	Wild	Wheat	Barley	Other Grains	Green Oats	Thins	Dehulls	Test	Moist.	Darks	Groat Yield (%)	Brokens	Frost Damage	Sprouted	Protein	Beta-Glucan
NARF	1	0.1	0	0	0	0	0	1.1	3	267	9.7	0.5	72.9	1	0	0	13.85	4.65
	2	0.1	0	0	0	0	0	0.9	2.2	264	9.5	0.8	73	0.5	0	0	14.06	4.83
	3	0.1	0	0	0	0	0	0.9	2	263	9.6	0.6	72.8	0.7	0	0	14.55	4.97
	4	0.1	0	0	0	0	0	0.9	3.2	266	9.6	0.4	73.9	1.2	0	0	14.77	4.96
	5	0.1	0.1	0	0	0	0	1.1	2.8	263	9.5	1.2	74.3	0.5	0	0	15.16	5.01
	6	0.1	0	0	0	0	0	0.8	2.4	265	9.4	0.5	76.9	0.5	0	0	13.1	4.84
	7	0.1	0.1	0	0	0	0	0.5	5.2	263	9.8	0.5	76.5	0.8	0	0	13.25	4.88
	8	0.1	0	0	0	0	0	0.5	4.2	264	9.3	0.6	77.5	0.7	0	0	13.97	5.05
	9	0.1	0	0	0	0	0	0.7	6.4	262	9.5	0.5	77.2	0.8	0	0	14.02	5.15
	10	0.1	0	0	0	0	0	0.5	7.6	265	9.4	0.5	77.2	0.6	0	0	14.72	5.24
	11	0.1	0	0	0	0	0	1.5	5.9	265	9.5	0.6	71.1	0.8	0	0	13.49	5.07
	12	0.1	0	0	0	0	0	1.1	3	265	9.7	0.5	71.3	1.4	0	0	13.98	5.18
	13	0.1	0	0	0	0	0	1.2	5.9	267	9.6	0.2	70	2.1	0	0	14.97	5.5
	14	0.1	0	0	0	0	0	1.3	5.4	263	9.7	0.6	70	2.3	0	0	14.52	5.51
	15	0.16	0.1	0	0	0	0	1.7	4	263	9.8	0.8	71.7	2	0	0	14.85	5.46

Table 16. Results of Milling Analysis completed by Grain Millers for Evaluating the fertility package of newly available Oat Milling Varieties in SK in 2025 at WARC.

Site	TRT no	Dockage	Wild	Wheat	Barley	Other Grains	Green Oats	Thins	Dehulls	Test	Moist.	Darks	Groat Yield (%)	Brokens	Frost Damage	Sprouted	Protein	Beta-Glucan
WARC	1	0.18	0.1	0.1	0	0	0	0.3	1.5	251	12.1	0.4	72.1	0.8	0	0	14.97	4.93
	2	0.1	0	0	0	0	0	0.7	1.9	251	12.2	3	71.9	0.8	0	0	15.37	4.96
	3	0.1	0.2	0	0	0	0	0.9	1.8	250	11.3	0.3	72.1	1	0	0	15.33	4.99
	4	0.1	0.1	0	0	0	0	0.7	2.1	248	12	0.3	71.9	1.4	0	0	15.61	5.09
	5	0.1	0.1	0	0	0	0	2	1.4	250	12.5	0.3	73.3	0.8	0	0	15.41	4.93
	6	0.1	0.1	0	0	0	0	0.2	3.2	253	12.7	0.5	74.9	0.5	0	0	14.27	4.97
	7	0.5	0.1	0	0	0	0	0.2	3.6	254	13	0.6	75.6	0.4	0	0	14.17	4.95
	8	0.16	0.2	0.1	0	0	0	0.36	3.1	252	12.5	0.3	75	0.3	0	0	14.13	5.11
	9	0.16	0.2	0	0	0	0	0.4	3.1	254	12.6	0.5	76.7	0.4	0	0	14.6	5.04
	10	0.1	0	0	0	0	0	0.6	3.2	249	12.2	0.3	76	0.4	0	0	15	5.07
	11	0.14	0.1	0	0	0	0	0.66	2.2	259	13	0.1	71.1	1	0	0	13.67	4.97
	12	0.15	0.1	0	0	0	0	0.7	2.4	254	13.6	0.3	70.5	1.2	0	0	14.5	5.2
	13	0.18	0.2	0	0	0	0	1	2.1	259	12.9	0.4	71	2	0	0	14.54	5.26
	14	0.1	0	0	0	0	0	0.9	3	256	13.5	0.3	62.5	1.3	0	0	14.23	5.27
	15	0.15	0	0	0	0	0	1	3.1	258	13.2	0.6	70.8	1	0	0	14.73	5.31

Table 17. Results of Milling Analysis completed by Grain Millers for Evaluating the fertility package of newly available Oat Milling Varieties in SK in 2025 at IHARF

Site	TRT no	Dockage	Wild	Wheat	Barley	Other Grains	Green Oats	Thins	Dehulls	Test	Moist.	Darks	Groat Yield (%)	Brokens	Frost Damage	Sprouted	Protein	Beta-Glucan
IHARF	1	0.3	0	0	0	0	0	2.3	3.2	275	N/A	0.2	70.5	2.1	0	0	14.74	4.87
	2	0.2	0	0	0	0	0	2.3	2.6	268	7.8	0.2	70.4	1.7	0	0	15.9	4.96
	3	0.2	0	0	0	0	0	2.3	2.6	267	N/A	0.2	71.4	1.9	0	0	16.99	5.2
	4	0.3	0	0	0	0	0	1.8	1.9	267	N/A	0.2	71.2	1.6	0	0	17.03	5.32
	5	0.3	0	0	0	0	0	2.4	3.8	272	7.78	0.2	71.1	1.9	0	0	17.32	5.43
	6	0.4	0	0	0	0	0	3.3	2.8	270	7.7	0.4	73.9	1.4	0	0	13.86	4.77
	7	0.3	0	0	0	0	0	1.5	3.2	266	7.7	0.3	74.4	1.1	0	0	15.19	5.06
	8	0.3	0	0	0	0	0	3.3	5	268	7.8	0.4	71.4	1.1	0	0	15.79	5.28
	9	0.4	0	0	0	0	0	1.4	4	271	7.6	0.3	73.6	1.3	0	0	16.55	5.41
	10	0.4	0	0	0	0	0	1.5	4.5	270	7.5	0.2	74.4	0.9	0	0	16.74	5.2
	11	0.4	0	0	0	0	0	2.4	3.8	276	7.6	0.3	70	2.1	0	0	14.35	5.07
	12	0.3	0.1	0	0	0	0	3.3	3.2	248	7.8	0.3	69.7	2.1	0	0	15.21	5.29
	13	0.4	0	0	0	0	0	3	5.3	279	N/A	0.4	70.1	2.8	0	0	15.59	5.37
	14	0.5	0	0	0	0	0	1.3	2.8	277	7.7	0.6	68.9	2	0	0	16.4	5.52
	15	0.4	0	0	0	0	0	2.5	5.4	277	7.7	0.4	71	2.3	0	0	16.45	5.39

Table 18. Results of Milling Analysis completed by Grain Millers for Evaluating the fertility package of newly available Oat Milling Varieties in SK in 2025 at ECRF

Site	TRT no	Dockage	Wild	Wheat	Barley	Other Grains	Green Oats	Thins	Dehulls	Test	Moist.	Darks	Groat Yield (%)	Brokens	Frost Damage	Sprouted	Protein	Beta-Glucan
ECRF	1	0.14	0	0	0	0	0	1.5	7.4	263	10.8	1.1	73.2	1.6	0	1.6	12.61	4.71
	2	0.2	0	0.1	0	0	0	1.5	4.6	263	10.8	0.8	72.8	1.7	0	1.5	13.52	4.95
	3	0.2	0	0	0	0	0	1.5	5.7	267	10.7	1	73.1	1.4	0	0.5	13.7	4.98
	4	0.2	0	0	0	0	0	1	5.9	264	10.6	1.1	74.4	0.8	0	1.1	14.2	5.06
	5	1.1	0	0	0	0	0	1.3	7	260	10.7	1.5	74.6	1	0	0.4	14.51	5.11
	6	0.4	0	0	0	0	0	0.7	7.8	265	10.7	1	75.4	0.8	0	1	11.66	4.76
	7	0.4	0	0.1	0	0	0	0.8	7.2	268	10.6	2	76.9	0.7	0	5.2	12.62	5.01
	8	0.2	0	0	0	0	0	1.1	6.1	265	10.8	3	78.2	0.5	0	5	12.62	4.95
	9	0.5	0	0	0	0	0	0.6	6.4	264	10.4	3.3	70.7	0.3	0	2.6	13.52	4.85
	10	0.2	0	0.1	0	0	0	0.7	6	264	10.7	4	77.9	0.6	0	0	13.37	5.06
	11	0.4	0	0	0	0	0	1.6	2.4	270	10.9	0.5	70	1.5	0	0.3	12.37	4.98
	12	0.7	0	0	0	0	0	1.8	3.2	261	10.7	0.4	72.8	1.8	0	5	12.96	5.13
	13	0.4	0	0.1	0	0	0	1.7	5	266	10.5	5	72.5	1.8	0	0.4	13.52	5.23
	14	0.4	0	0	0	0	0	1.7	6.8	263	10.9	2	70.7	3.2	0	5.9	13.91	5.5
	15	0.5	0	0	0	0	0	1.7	8.4	263	10.8	0.4	73	1.9	0	3	14.1	5.26