

APAS Carbon Costing

April 1, 2019:

Application of Federal Carbon Backstop to SK

\$20/tCO_{2e} in 2019 and rising \$10/year to \$50/tCO_{2e} in 2022

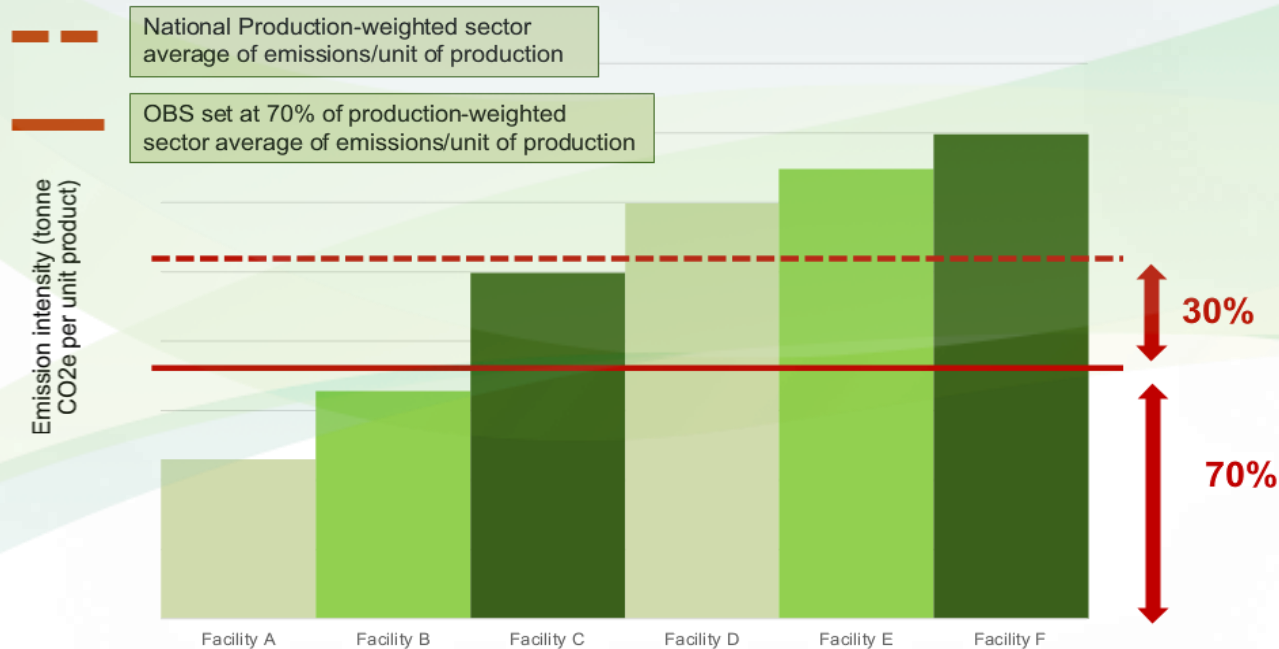
Fuel	Unit	2018 (\$10/tCO _{2e})	2019 (\$20/tCO _{2e})	2020 (\$30/tCO _{2e})	2021 (\$40/tCO _{2e})	2022 (\$50/tCO _{2e})
Gasoline	¢/L	2.33	4.65	6.98	9.30	11.63
Diesel	¢/L	2.74	5.48	8.21	10.95	13.69
Natural gas	¢/ m ³	1.96	3.91	5.87	7.83	9.79
Propane	¢/L	1.55	3.10	4.64	6.19	7.74

APAS Carbon Costing

- Fertilizer
- Grain Drying
- Rail
- Trucking
- Heating
- Electricity

Fertilizer

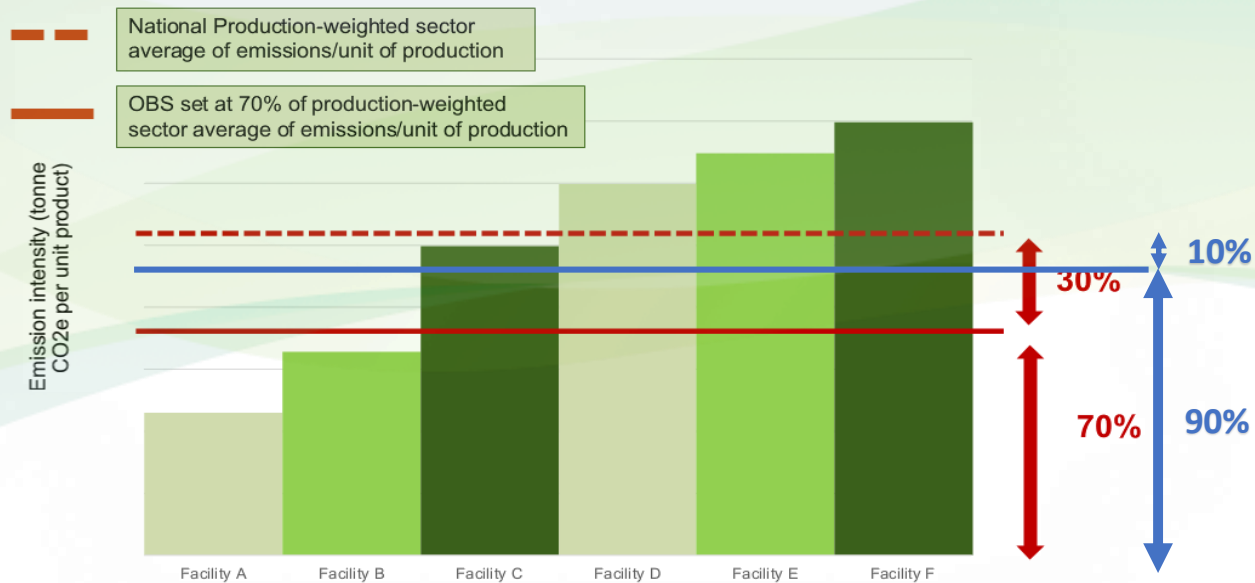
- Nitrogen fertilizer plants subject to OBPS in backstop jurisdictions
- Environment and Climate Change Canada proposed that output-based standards be set at 70% of an industrial sector's average greenhouse gas emissions intensity as a starting point.



Fertilizer

Four sectors assessed to be in a high competitive risk category will have their output-based standard adjusted to 90% of the sector's average greenhouse gas emissions intensity. They are:

- cement
- iron and steel manufacturing
- lime
- nitrogen fertilizer



Grain Drying (2019)

Scenario:

Drop the moisture on 400 bushels of spring wheat in the black soil zone by 5%

Dryer:

170m³/hr of natural gas at 10psi to run a 6 million BTU dryer with a 400bu-5point per hour capacity

Assumptions:

- 4 million BTU or 112m³/hr
- Dryer is only running the burner for about 30 minutes/hr
 - 10 minutes to fill
 - 30 minutes to heat/dry
 - 10 minutes to cool the grain
 - 10minutes to empty the dryer

56m³/hr of Natural gas at 10psi

$$\begin{aligned} & \$0.0391/\text{m}^3 \text{ of natural gas Carbon Cost} * 56\text{m}^3/\text{hr} \\ & = \$2.19/\text{hr} \end{aligned}$$

$$\begin{aligned} & (\$1.74/\text{hr}) / (400 \text{ bushel}/\text{hr}) \\ & = \$0.00547/\text{bushel} \end{aligned}$$

$$\begin{aligned} & (\$0.00547/\text{bushel}) * 65.2 \text{ bushels}/\text{acre} \\ & = \mathbf{\$0.36}/\text{acre} \end{aligned}$$

2019 SK Crop Planning Guide:
Spring Wheat in Black Soil Zone

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56m³/hr of Natural gas at 10psi

$$\begin{aligned} & \$0.0979/\text{m}^3 \text{ of natural gas Carbon Cost} * 56\text{m}^3/\text{hr} \\ & = \$5.48/\text{hr} \end{aligned}$$

$$\begin{aligned} & (\$5.48/\text{hr}) / (400 \text{ bushel}/\text{hr}) \\ & = \$0.0137/\text{bushel} \end{aligned}$$

$$\begin{aligned} & (\$0.00434/\text{bushel}) * 65.2 \text{ bushels}/\text{acre} \\ & = \mathbf{\$0.89}/\text{acre} \end{aligned}$$

2019 SK Crop Planning Guide:
Spring Wheat in Black Soil Zone

Rail (2019)

Scenario:

Hauling Spring Wheat from Melfort to Vancouver via CP

Distance:

1970 km or 1224.1 miles (Rail Atlas)

- 464.5 km or 288.5 miles in SK (23.4%)
- 792.5 km or 492.3 miles in Alb (40%)
- 715 km or 444.2 miles in BC (36%)

Carbon Surcharge (per revenue car mile):

- \$0.033/mile in SK (\$20/tCO_{2e})
- \$0.058/mile in Alb (\$30/tCO_{2e})
- \$0.067/mile in BC (\$40/tCO_{2e})

Revenue car mile: rail miles for loaded or empty revenue railcar movements

Canadian Rail Atlas

$$\begin{aligned} & \$0.033/\text{mile in SK} * 288.5 \text{ miles} \\ & = \$9.52 \end{aligned}$$

Canadian Rail Atlas

$$\begin{aligned} & \$0.058/\text{mile in Alb} * 492.3 \text{ miles} \\ & = \$28.55 \end{aligned}$$

Canadian Rail Atlas

$$\begin{aligned} & \$0.067/\text{mile in BC} * 444.2 \text{ miles} \\ & = \$29.76 \end{aligned}$$

$$\text{Total} = \$67.83 \text{ per car}$$

Rail (2019)

Scenario:

Hauling Spring Wheat from Melfort to Vancouver via CP

Assumptions:

- 3300 bushels spring wheat/rail car

$$(\$67.83 \text{ per rail car}) / (3300 \text{ bushels/rail car}) \\ = \$0.0206/\text{bushel}$$

$$(\$0.0206/\text{bushel}) * (65.2 \text{ bushels/acre}) \\ = \$1.34/\text{acre}$$

2019 SK Crop Planning Guide:
Spring Wheat in Black Soil Zone

Rail (2022)

Scenario:

Hauling Spring Wheat from Melfort to Vancouver via CP

Distance:

1970 km or 1224.1 miles (Rail Atlas)

Assumption:

Carbon Surcharge (per revenue car mile):
if \$0.033/mile in SK (\$20/tCO_{2e})
and \$0.067/mile in BC (\$40/tCO_{2e})
then \$0.084/mile SK to BC (\$50/tCO_{2e})

Revenue car mile: rail miles for loaded or empty revenue railcar movements

Canadian Rail Atlas

\$0.084/miles * 1224.1 miles

= \$102.82 per rail car

(\$102.82 per rail car) / (3300 bushels/rail car)

= \$0.0312/bushel

(\$0.0206/bushel) * (65.2 bushels/acre)

= \$2.03/acre

2019 SK Crop Planning Guide:
Spring Wheat in Black Soil Zone

Trucking (2019)

Scenario:

Hauling Spring Wheat from Farm to Elevator

Distance:

63 km or 39.4 miles as the average distance from farm to elevator according to 2002 Quorum report Commercial Trucking Rates in the Movement of Western Canadian Grain

- 219 elevators in 2002
- 181 elevators in 2019

Update with distances for your operation

Assumption:

Consumption by full loaded Super B

- 4.5 mpg or 0.99 mpl

Consumption when empty (40% less)

- 6.3 mpg or 1.39 mpl

Loaded:

$(39.4 \text{ miles}) / (0.99 \text{ miles/litre})$

= 39.8 litres farm to elevator

$(39.8 \text{ litres farm to elevator}) * (\$0.055 \text{ carbon cost/litre of diesel})$

= \$2.20 Farm to Elevator

Empty:

$(39.4 \text{ miles}) / (1.39 \text{ miles/litre})$

= 28.3 litres to farm (from elevator)

$(28.3 \text{ litres to farm}) * (\$0.055 \text{ carbon cost/litre of diesel})$

= \$1.55 To Farm (From Elevator)

Trucking (2019)

Scenario:

Hauling Spring Wheat from Farm to Elevator

Assumption:

1500 bushel Super B

$$(\$3.75 \text{ per trip}) / (1500 \text{ bushels/trip}) \\ = \$0.0025 / \text{bushel}$$

$$(\$0.0025 / \text{bushel}) * (65.2 \text{ bushels/acre}) \\ = \$0.16/\text{acre}$$

2019 SK Crop Planning Guide:
Spring Wheat in Black Soil Zone

Trucking (2022)

Scenario:

Hauling Spring Wheat from Farm to Elevator

Distance:

63 km or 39.4 miles as the average distance from farm to elevator according to 2002 Quorum report Commercial Trucking Rates in the Movement of Western Canadian Grain

- 219 elevators in 2002
- 181 elevators in 2019

Update with distances for your operation

Assumption:

Consumption by full loaded Super B

- 4.5 mpg or 0.99 mpl

Consumption when empty (40% less)

- 6.3 mpg or 1.39 mpl

Loaded:

$(39.4 \text{ miles}) / 0.99 \text{ miles/litre}$
= 39.8 litres farm to elevator

$(39.8 \text{ litres farm to elevator}) * (\$0.1369 \text{ carbon cost/litre of diesel})$
= \$5.45 Farm to Elevator

Empty:

$(39.4 \text{ miles}) / (1.39 \text{ miles/litre})$
= 28.3 litres to farm (from elevator)

$(28.3 \text{ litres to farm}) * (\$0.1369 \text{ carbon cost/litre of diesel})$
= \$3.88 To Farm (From Elevator)

Trucking (2022)

Scenario:

Hauling Spring Wheat from Farm to Elevator

Assumption:

1500 bushel Super B

$$(9.33 \text{ per trip}) / (1500 \text{ bushels/trip}) \\ = \$0.0062 / \text{bushel}$$

$$(\$0.0062 / \text{bushel}) * (65.2 \text{ bushels/acre})$$

$$= \$0.40/\text{acre}$$

2019 SK Crop Planning Guide:
Spring Wheat in Black Soil Zone

Heating (2019)

SaskEnergy Natural Gas Rate April 1, 2019:

\$0.0998 Cost/m³ Natural Gas

Carbon Levy (\$20/tonne):

\$0.0391 Cost/m³ Natural Gas

40% increase

Breakdown of Utilities and Miscellaneous Value in Crop Planning Guide from SK Ministry of Ag:

56% Electricity

28% Telephone

16% Heating

Assumption:

50% of heating cost is delivery

(\$4.90 Cost/Acre Utilities and Miscellaneous Black Soil Zone)

* (16% Heating)

= \$0.78 Cost for heating fuel/acre

(\$0.78 Cost for heating fuel/acre) *

(50% of cost is delivery)

= \$0.39/acre commodity cost of heating fuel

(\$0.39/Acre) * (40% increase)

= **\$0.15 /acre**

Heating (2022)

Assumption:

50% of heating cost is delivery

Cost increase at \$50/tonne?:

\$0.0979 Cost/m³ Natural Gas

If \$0.0391 /m³ @ \$20/tonne produced a 40% increase

Then \$0.0979 /m³ @ \$50/tonne could produce a 100.1% increase?

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= \$0.78 Cost for heating fuel/acre

(\$0.78 Cost for heating fuel/acre) *

(50% of cost is delivery)

= \$0.39/acre commodity cost of heating fuel

(\$0.39/Acre) * (100% increase)

= **\$0.39 /acre**

Electricity (2019)

SaskPower Rate Increase April 1, 2019:

Residential Customer:

- \$18 annual increase in 2019
- carbon tax charge of 0.3095 cents / Kwh
- a 1.7% increase on the average residential customer bill

Farm:

- \$48 annual increase in 2019
- carbon tax charge of 0.2994 cents / Kwh
- an increase of 2.1% on the average farm customer bill

Breakdown of Utilities and Miscellaneous Value in Crop Planning Guide from SK Ministry of Ag:

56% Electricity
28% Telephone
16% Heating

(\$4.90 Cost/Acre Utilities and Miscellaneous Black Soil Zone)

* (56% Electricity)

= \$2.74 Cost for electricity/acre

(\$2.74 /acre) * (2.1% increase)

= **\$0.06 /acre**

Electricity (2022)

Assumption:

Farm:

- If \$20/tCO₂e created an increase of 2.1% on the average farm customer bill
- Then \$50/tCO₂e could feasibly create an increase of 5.25% on the average farm customer bill

Breakdown of Utilities and Miscellaneous Value in Crop Planning Guide from SK

Ministry of Ag:

- 56% Electricity
- 28% Telephone
- 16% Heating

(\$4.90 Cost/Acre Utilities and Miscellaneous Black Soil Zone)

* (56% Electricity)

= \$2.74 Cost for electricity/acre

(\$2.74 /acre) * (5.25% increase)

= **\$0.14 /acre**

APAS Carbon Costing

	2019 (\$20/tCO ₂ e) \$/acre	2022 (\$50/tCO ₂ e) \$/acre
Fertilizer	?	?
Grain Drying	0.36	0.89
Rail	1.34	2.03
Trucking	0.16	0.40
Heating	0.15	0.39
Electricity	0.06	0.14
Total	2.07/acre	3.85/acre

Other Costing

- Livestock costing future project

What will the carbon tax cost farmers each year?

		<i>Ctax \$25/t</i> CO ₂ e	<i>Ctax \$50/t</i> CO ₂ e	<i>Ctax \$200/t</i> CO ₂ e
Cattle (non dairy)	/animal/yr +GST	\$ 46	\$ 92	\$ 368
Dairy	/animal/yr +GST	\$ 119	\$ 238	\$ 952
Cropland	/acre/yr +GST	\$ 8	\$ 16	\$ 64

Source: November 29, 2017 Comments to Senate Standing Committee on Agriculture and Forestry by the Parliamentary Budget Officer