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## Canadian Crop Production Analysis

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```
library(RSQLite)
library(DBI)
library(ggplot2)
library(dplyr)

Warning message:
"package 'RSQLite' was built under R version 4.5.2"

Adjuntando el paquete: 'dplyr'

The following objects are masked from 'package:stats':
  filter, lag

The following objects are masked from 'package:base':
  intersect, setdiff, setequal, union
```

```
# Conect to SQLite
# Conexión a SQLite
con <- dbConnect(SQLite(), "FinalDB.sqlite")
```

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### Create tables / Crear tablas

Establish a connection **con** to the RSQLite database **FinalDB.sqlite**, and create the following four tables. / Establezca una conexión **con** a la base de datos RSQLite **FinalDB.sqlite** y cree las siguientes cuatro tablas.

1. **CROP\_DATA**
2. **FARM\_PRICES**
3. **DAILY\_FX**
4. **MONTHLY\_FX**

=====

```
dbExecute(con, "CREATE TABLE IF NOT EXISTS CROP_DATA (
    CD_ID INTEGER, DATE INTEGER, CROP_TYPE TEXT, GEO TEXT,
    SEDED_AREA REAL, HARVESTED_AREA REAL, PRODUCTION REAL, AVG_YIELD REAL)")
dbExecute(con, "CREATE TABLE IF NOT EXISTS FARM_PRICES (
    CD_ID INTEGER, DATE TEXT, CROP_TYPE TEXT, GEO TEXT, PRICE_PRERMT REAL)")
dbExecute(con, "CREATE TABLE IF NOT EXISTS DAILY_FX (
    DFX_ID INTEGER, DATE TEXT, FXUSDCAD REAL)")
dbExecute(con, "CREATE TABLE IF NOT EXISTS MONTHLY_FX (
    DFX_ID INTEGER, DATE TEXT, FXUSDCAD REAL)")
```

```
0
0
0
0
```

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Read Datasets and load your tables in database / Leer conjuntos de datos y cargar sus tablas en la base de datos

```
=====
crop <- read.csv("Annual_Crop_Data.csv")
farm <- read.csv("Monthly_Farm_Prices.csv")
fxd  <- read.csv("Daily_FX.csv")
fxm  <- read.csv("Monthly_FX.csv")

dbWriteTable(con, "CROP_DATA", crop, append=TRUE)
dbWriteTable(con, "FARM_PRICES", farm, append=TRUE)
dbWriteTable(con, "DAILY_FX", fxd, append=TRUE)
dbWriteTable(con, "MONTHLY_FX", fxm, append=TRUE)
```

=====

Agregate YEAR column / Agregar columna YEAR

```
=====
dbExecute(con, "ALTER TABLE CROP_DATA ADD COLUMN YEAR INTEGER")
dbExecute(con, "ALTER TABLE FARM_PRICES ADD COLUMN YEAR INTEGER")
dbExecute(con, "ALTER TABLE DAILY_FX ADD COLUMN YEAR INTEGER")
dbExecute(con, "ALTER TABLE MONTHLY_FX ADD COLUMN YEAR INTEGER")
```

```
0
0
0
0
```

=====

Populate YEAR column from DATE / Poblar columna YEAR desde DATE

```
=====
dbExecute(con, "UPDATE CROP_DATA SET YEAR = CAST(strftime('%Y', DATE) AS INTEGER)")
dbExecute(con, "UPDATE FARM_PRICES SET YEAR = CAST(strftime('%Y', DATE) AS INTEGER)")
dbExecute(con, "UPDATE DAILY_FX SET YEAR = CAST(strftime('%Y', DATE) AS INTEGER)")
dbExecute(con, "UPDATE MONTHLY_FX SET YEAR = CAST(strftime('%Y', DATE) AS INTEGER)")
```

```
672
2678
1033
50
```

=====

How many records are in the farm prices dataset? / ¿Cuántos registros hay en el conjunto de datos de precios agrícolas?

```
=====
dbGetQuery(con, "
SELECT COUNT(*) AS total_registros
FROM FARM_PRICES
")
```

```
A data.frame: 1 × 1
total_registros
<int>
2678
```

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Which geographies are included in the farm prices dataset? / ¿Qué geografías están incluidas en el conjunto de datos de precios agrícolas?

=====

```
dbGetQuery(con, "
SELECT DISTINCT GEO AS provincia
FROM FARM_PRICES
ORDER BY provincia
")
```

A data.frame: 2  
  × 1

  provincia  
  <chr>  
  -----  
  Alberta  
  Saskatchewan

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How many hectares of Rye were harvested in Canada in 1968? / ¿Cuántas hectáreas de centeno se cosecharon en Canadá en 1968?

=====

```
dbGetQuery(con, "
SELECT HARVESTED_AREA AS hectareas_centeno
FROM CROP_DATA
WHERE CROP_TYPE = 'Rye' AND GEO = 'Canada' AND YEAR = 1968
")
```

A data.frame: 1 × 1

  hectareas\_centeno  
  <dbl>  
  -----  
  274100

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Query and display the first 6 rows of the farm prices table for Rye. / Consulta y muestra las primeras 6 filas de la tabla de precios agrícolas de centeno.

=====

```
dbGetQuery(con, "
SELECT *
FROM FARM_PRICES
WHERE CROP_TYPE = 'Rye'
ORDER BY DATE
LIMIT 6
")
```

A data.frame: 6 x 6

CD_ID	DATE	CROP_TYPE	GEO	PRICE_PRERMT	YEAR
<int>	<chr>	<chr>	<chr>	<dbl>	<int>
4	1985-01-01	Rye	Alberta	100.77	1985
5	1985-01-01	Rye	Saskatchewan	109.75	1985
10	1985-02-01	Rye	Alberta	95.05	1985
11	1985-02-01	Rye	Saskatchewan	103.46	1985
16	1985-03-01	Rye	Alberta	96.77	1985
17	1985-03-01	Rye	Saskatchewan	106.38	1985

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Which provinces grew Barley? / ¿Qué provincias cultivan cebada?

=====

```
dbGetQuery(con, "
SELECT DISTINCT GEO AS provincia
FROM CROP_DATA
WHERE CROP_TYPE = 'Barley'
ORDER BY provincia
")
```

A data.frame: 3  
  x 1  
  
  provincia  
  <chr>  
    -----  
    Alberta  
    Canada  
    Saskatchewan

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Find the first and last dates for the farm prices data. / Encuentre la primera y la última fecha de los datos de precios agrícolas.

=====

```
dbGetQuery(con, "
SELECT MIN(DATE) AS primera_fecha, MAX(DATE) AS ultima_fecha
FROM FARM_PRICES
")
```

A data.frame: 1 x 2  
  
  primera\_fecha  ultima\_fecha  
  <chr>          <chr>  
    -----  
    1985-01-01    2020-12-01

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Which crops have ever reached a farm price greater than or equal to \$350 per metric tonne? / ¿Qué cultivos han alcanzado alguna vez un precio agrícola mayor o igual a 350 dólares por tonelada métrica?

```
=====
```

```
dbGetQuery(con, "
SELECT DISTINCT CROP_TYPE AS cultivo
FROM FARM_PRICES
WHERE PRICE_PRERMT >= 350
ORDER BY cultivo
")
```

```
A
data.frame:
1 x 1
cultivo
<chr>
Canola
```

```
=====
```

Rank the crop types harvested in Saskatchewan in the year 2000 by their average yield. Which crop performed best? / Clasifique los cultivos cosechados en Saskatchewan en el año 2000 según su rendimiento promedio. ¿Cuál tuvo el mejor rendimiento?

```
=====
```

```
dbGetQuery(con, "
SELECT CROP_TYPE AS cultivo, AVG(HARVESTED_AREA) AS rendimiento_promedio
FROM CROP_DATA
WHERE GEO = 'Saskatchewan' AND YEAR = 2000
GROUP BY cultivo
ORDER BY rendimiento_promedio DESC
")
```

```
A data.frame: 4 x 2
cultivo rendimiento_promedio
<chr>      <dbl>
Wheat        6080300
Canola       2371500
Barley       1922300
Rye          46500
```

```
=====
```

Rank the crops and geographies by their average yield (KG per hectare) since the year 2000. Which crop and province had the highest average yield since the year 2000? / Clasifique los cultivos y las geografías según su rendimiento promedio (KG por hectárea) desde el año 2000. ¿Qué cultivo y provincia tuvieron el rendimiento promedio más alto desde el año 2000?

```
=====
```

```
dbGetQuery(con, "
SELECT GEO AS provincia, CROP_TYPE AS cultivo,
AVG(HARVESTED_AREA) AS rendimiento_promedio
FROM CROP_DATA
WHERE YEAR >= 2000
GROUP BY provincia, cultivo
ORDER BY rendimiento_promedio DESC
")
```

A data.frame: 12 × 3		
provincia	cultivo	rendimiento_promedio
<chr>	<chr>	<dbl>
Canada	Wheat	9550114.29
Canada	Canola	6824609.52
Saskatchewan	Wheat	5145547.62
Saskatchewan	Canola	3506371.43
Canada	Barley	3072390.48
Alberta	Wheat	2652728.57
Alberta	Canola	2086385.71
Alberta	Barley	1362314.29
Saskatchewan	Barley	1243538.10
Canada	Rye	115680.95
Saskatchewan	Rye	47038.10
Alberta	Rye	18980.95

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Use a subquery to determine how much wheat was harvested in Canada in the most recent year of the data. / Utilice una subconsulta para determinar cuánto trigo se cosechó en Canadá en el año más reciente de los datos.

=====

```
dbGetQuery(con, "
SELECT SUM(PRODUCTION) AS trigo_tonnes_canada_ultimo_anio
FROM CROP_DATA
WHERE CROP_TYPE = 'Wheat'
AND YEAR = (SELECT MAX(YEAR) FROM CROP_DATA WHERE CROP_TYPE = 'Wheat')
")

A data.frame: 1 × 1
trigo_tonnes_canada_ultimo_anio
<dbl>
1 62208200
```

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Use an implicit inner join to calculate the monthly price per metric tonne of Canola grown in Saskatchewan in both Canadian and US dollars. Display the most recent 6 months of the data. / Utilice una unión interna implícita para calcular el precio mensual por tonelada métrica de canola cultivada en Saskatchewan, tanto en dólares canadienses como estadounidenses. Visualice los datos de los últimos 6 meses.

=====

```
dbGetQuery(con, "
SELECT fp.DATE, fp.GEO, fp.CROP_TYPE,
fp.PRICE_PRERMT AS precio_cad,
ROUND(fp.PRICE_PRERMT / fx.FXUSDCAD, 2) AS precio_usd
FROM FARM_PRICES fp, MONTHLY_FX fx
WHERE fp.CROP_TYPE = 'Canola' AND fp.GEO = 'Saskatchewan' AND fp.DATE = fx.DATE
ORDER BY fp.DATE DESC
LIMIT 6
")
```

A data.frame: 6 × 5

DATE	GEO	CROP_TYPE	precio_cad	precio_usd
<chr>	<chr>	<chr>	<dbl>	<dbl>
2020-12-01	Saskatchewan	Canola	507.33	396.11
2020-11-01	Saskatchewan	Canola	495.64	379.27
2020-10-01	Saskatchewan	Canola	474.80	359.30
2020-09-01	Saskatchewan	Canola	463.52	350.41
2020-08-01	Saskatchewan	Canola	464.60	351.38
2020-07-01	Saskatchewan	Canola	462.88	342.91

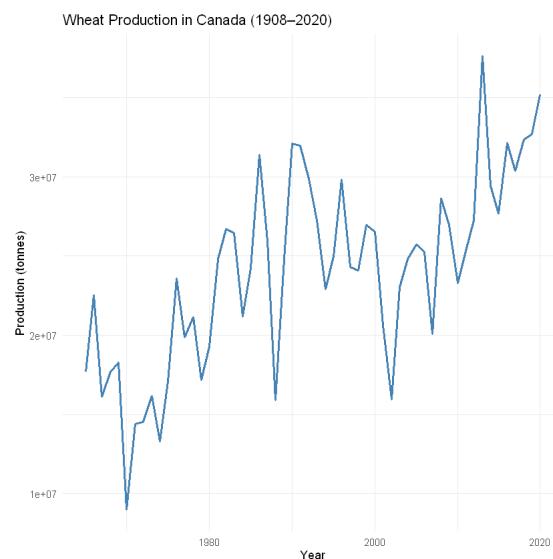
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Historical wheat production in Canada / Producción histórica de trigo en Canadá

=====

```
wheat_data <- dbGetQuery(con, "
SELECT YEAR, PRODUCTION FROM CROP_DATA
WHERE CROP_TYPE = 'Wheat' AND GEO = 'Canada'
ORDER BY YEAR")

ggplot(wheat_data, aes(x=YEAR, y=PRODUCTION)) +
  geom_line(color="steelblue", size=1) +
  labs(title="Wheat Production in Canada (1908-2020)",
       x="Year", y="Production (tonnes)") +
  theme_minimal()
```



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Average yield by province since 2000/ Rendimiento promedio por provincia desde 2000

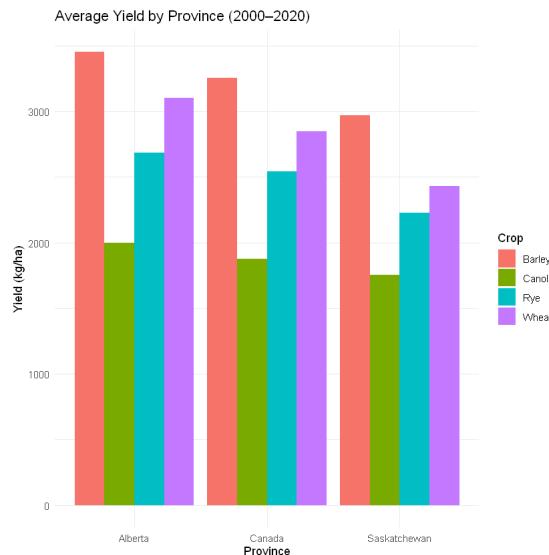
=====

```
yield_data <- dbGetQuery(con, "
SELECT GEO AS Province, CROP_TYPE AS Crop,
AVG(AVG_YIELD) AS AvgYield
FROM CROP_DATA
WHERE YEAR >= 2000
GROUP BY Province, Crop")
```

```

ggplot(yield_data, aes(x=Province, y=AvgYield, fill=Crop)) +
  geom_bar(stat="identity", position="dodge") +
  labs(title="Average Yield by Province (2000-2020)",
       x="Province", y="Yield (kg/ha)") +
  theme_minimal()

```



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### Canola Prices vs. Exchange Rate / Precios de Canola vs Tipo de Cambio

```

canola_fx <- dbGetQuery(con, "
SELECT fp.DATE, fp.PRICE_PRERMT AS PriceCAD, fx.FXUSDCAD
FROM FARM_PRICES fp
JOIN MONTHLY_FX fx ON fp.DATE = fx.DATE
WHERE fp.CROP_TYPE = 'Canola' AND fp.GEO = 'Saskatchewan'
ORDER BY fp.DATE")

canola_fx$DATE <- as.Date(canola_fx$DATE)

ggplot(canola_fx, aes(x=DATE)) +
  geom_line(aes(y=PriceCAD), color="darkgreen", size=1) +
  geom_line(aes(y=FXUSDCAD*100), color="red", linetype="dashed") +
  labs(title="Canola Prices vs CAD/USD Exchange Rate",
       x="Date", y="Price (CAD/MT) & FX*100") +
  theme_minimal()

```

Canola Prices vs CAD/USD Exchange Rate

