Problem description:

In agriculture sector where farmers and agribusinesses have to make innumerable decisions every day and intricate complexities involves the various factors influencing them. An essential issue for agricultural planning intention is the accurate yield estimation for the numerous crops involved in the planning. Data mining techniques are necessary approach for accomplishing practical and effective solutions for this problem. Agriculture has been an obvious target for big data. Environmental conditions, variability in soil, input levels, combinations and commodity prices have made it all the more relevant for farmers to use information and get help to make critical farming decisions. Mining the large amount of existing crop, soil and climatic data, and analysing new, non-experimental data optimizes the production and makes agriculture more resilient to climatic change.

Dataset Used: crop_production.csv

State_Name	District_Name	Crop_Year	Season	Crop	Area	Production
Andaman and Nicobar Islands	NICOBARS	2000	Kharif	Arecanut	1254	2000
Andaman and Nicobar Islands	NICOBARS	2000	Kharif	Other Kharif pulses	2	1
Andaman and Nicobar Islands	NICOBARS	2000	Kharif	Rice	102	321
Andaman and Nicobar Islands	NICOBARS	2000	Whole Year	Banana	176	641
Andaman and Nicobar Islands	NICOBARS	2000	Whole Year	Cashewnut	720	165
Andaman and Nicobar Islands	NICOBARS	2000	Whole Year	Coconut	18168	65100000
Andaman and Nicobar Islands	NICOBARS	2000	Whole Year	Dry ginger	36	100
Andaman and Nicobar Islands	NICOBARS	2000	Whole Year	Sugarcane	1	2
Andaman and Nicobar Islands	NICOBARS	2000	Whole Year	Sweet potato	5	15
Andaman and Nicobar Islands	NICOBARS	2000	Whole Year	Tapioca	40	169
Andaman and Nicobar Islands	NICOBARS	2001	Kharif	Arecanut	1254	2061
Andaman and Nicobar Islands	NICOBARS	2001	Kharif	Other Kharif pulses	2	1

Pig commands:

pig -x local

agriculture= load '/home/hadoop/Documents/miniproject/crop_production.csv' using PigStorage(',') as (State_Name:chararray,District_Name:chararray,Crop_Year:int,Season:chararray,Crop:chararray,Area:int,Production:int);

describe agriculture;

dump agriculture;

statewise_group = group agriculture by State_Name;

dump statewise_group;

store statewise_group into '/home/hadoop/Documents/miniproject/statewise_output';

filter_district = filter agriculture by District_Name == 'MADURAI';

dump filter_district;

store filter_district into '/home/hadoop/Documents/miniproject/filter_output;

order_year = order agriculture by Crop_Year desc;

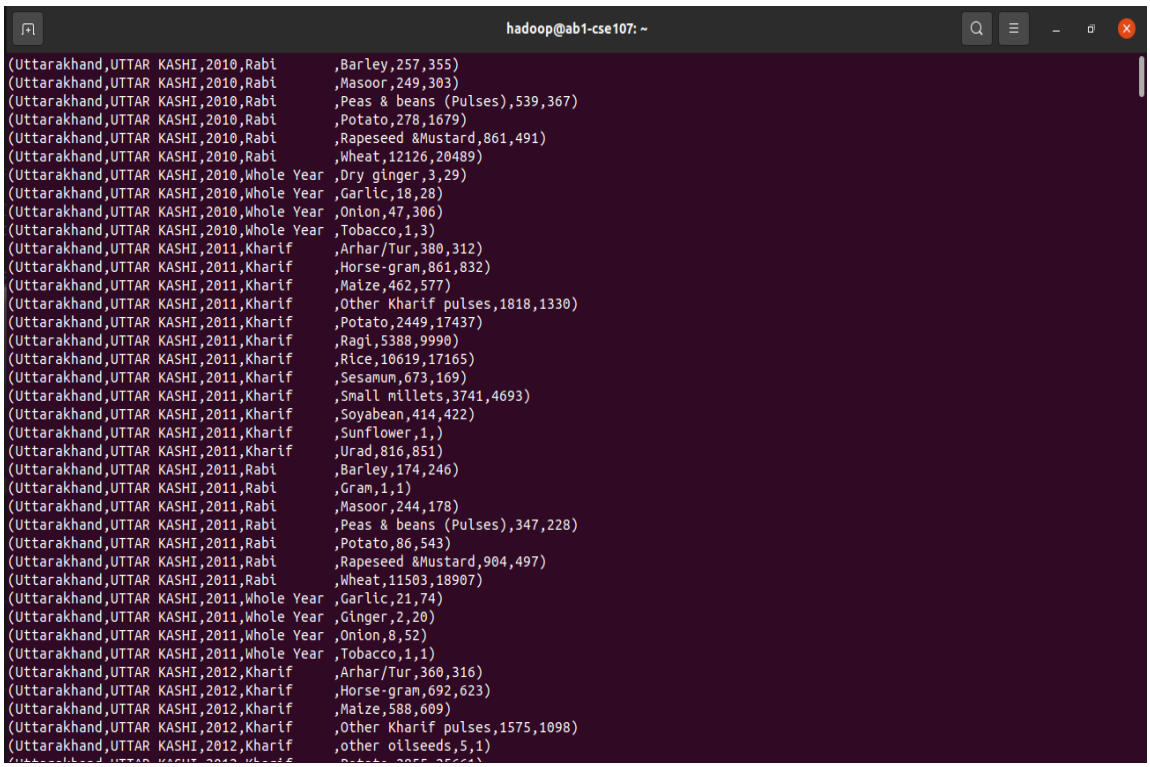
dump order_year;

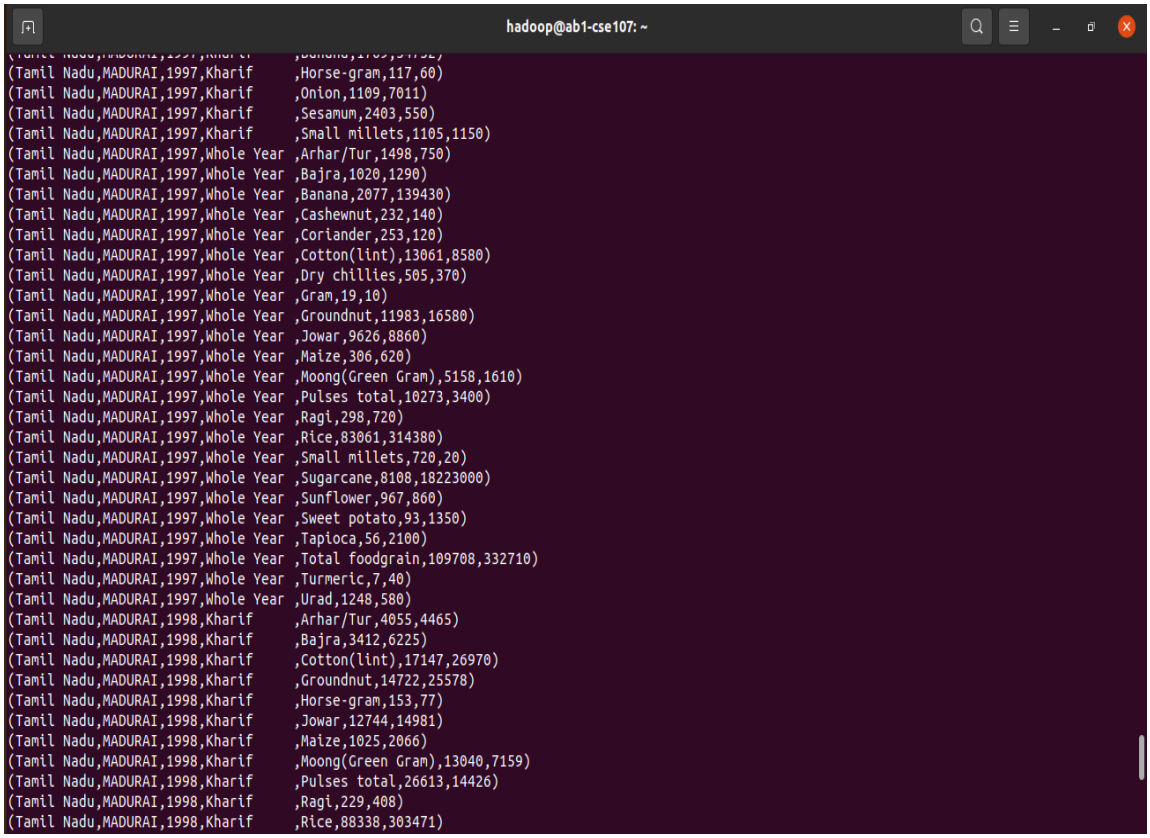
foreach_crop = foreach agriculture generate Crop;

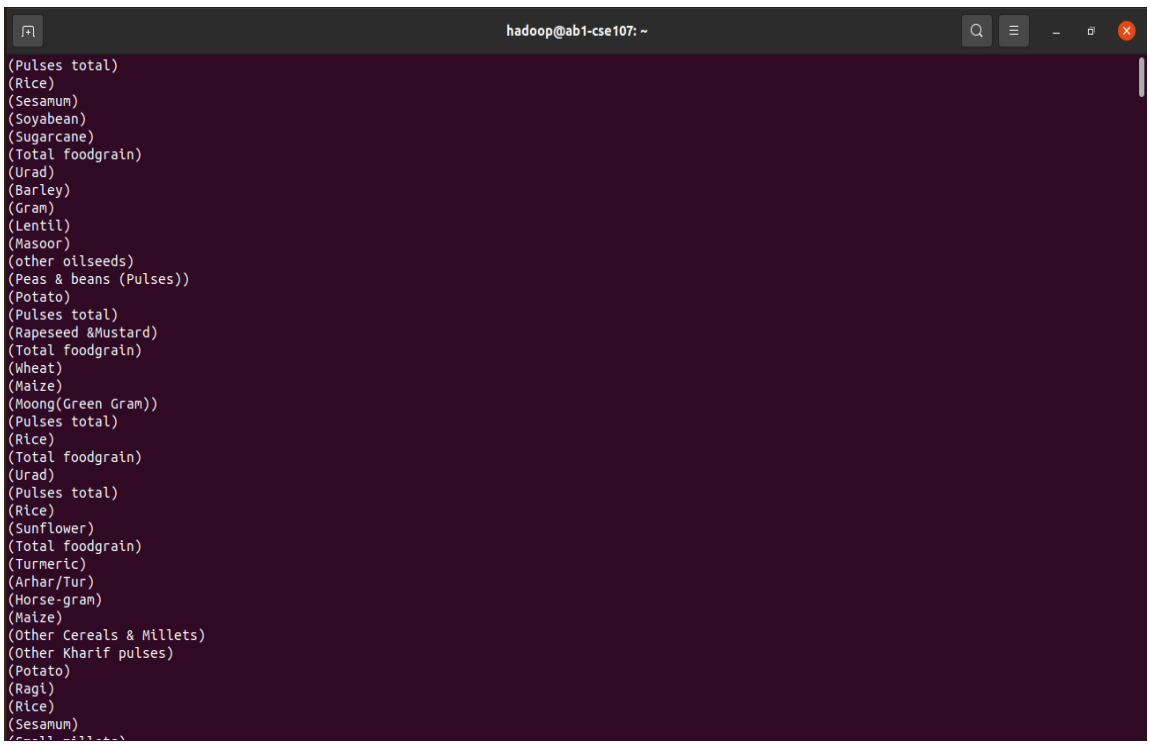
dump foreach_crop;

Output:


hadoop@ab1-cse107: ~
hadoop@ab1-cse107:~$ pig -x local
2022-11-05 09:35:56,630 INFO pig.ExecTypeProvider: Trying ExecType : LOCAL
2022-11-05 09:35:56,631 INFO pig.ExecTypeProvider: Picked LOCAL as the ExecType
2022-11-05 09:35:56,665 [main] INFO org.apache.pig.Main - Apache Pig version 0.17.0 (r1797386) compiled Jun 02 2017, 15:41:58
2022-11-05 09:35:56,665 [main] INFO org.apache.pig.Main - Logging error messages to: /home/hadoop/pig_1667621156663.log
2022-11-05 09:35:56,679 [main] INFO org.apache.pig.impl.util.Utils - Default bootup file /home/hadoop/.pigbootup not found
2022-11-05 09:35:56,740 [main] INFO org.apache.hadoop.conf.Configuration.deprecation - mapred.job.tracker is deprecated. Instead, use mapreduce.jobtracker.address
2022-11-05 09:35:56,742 [main] INFO org.apache.pig.backend.hadoop.executionengine.HExecutionEngine - Connecting to hadoop file system at: file:///
2022-11-05 09:35:56,804 [main] INFO org.apache.hadoop.conf.Configuration.deprecation - io.bytes.per.checksum is deprecated. Instead, use dfs.bytes-per-checksum
2022-11-05 09:35:56,817 [main] INFO org.apache.pig.PigServer - Pig Script ID for the session: PIG-default-92cc4cb0-d19c-45f0-9874-cad10aa0fd54
2022-11-05 09:35:56,817 [main] WARN org.apache.pig.PigServer - ATS is disabled since yarn.timeline-service.enabled set to false
grunt> agriculture= load '/home/hadoop/Documents/miniproject/crop_production.csv' using PigStorage(',') as (State_Name:chararray,District_Name:chararray,Crop_Year:int,Season:chararray,Crop:chararray,Area:int,Production:int);
2022-11-05 09:36:05,908 [main] INFO org.apache.hadoop.conf.Configuration.deprecation - io.bytes.per.checksum is deprecated. Instead, use dfs.bytes-per-checksum
grunt> describe agriculture;
agriculture: {State_Name: chararray,District_Name: chararray,Crop_Year: int,Season: chararray,Crop: chararray,Area: int,Production: int}
grunt> dump agriculture;


hadoop@ab1-cse107: ~
(Uttarakhand,UTTAR KASHI,2010,Rabi ,Barley,257,355)
(Uttarakhand,UTTAR KASHI,2010,Rabi ,Masoor,249,303)
(Uttarakhand,UTTAR KASHI,2010,Rabi ,Peas & beans (Pulses),539,367)
(Uttarakhand,UTTAR KASHI,2010,Rabi ,Potato,278,1679)
(Uttarakhand,UTTAR KASHI,2010,Rabi ,Rapeseed &Mustard,861,491)
(Uttarakhand,UTTAR KASHI,2010,Rabi ,Wheat,12126,20489)
(Uttarakhand,UTTAR KASHI,2010,Whole Year ,Dry ginger,3,29)
(Uttarakhand,UTTAR KASHI,2010,Whole Year ,Garlic,18,28)
(Uttarakhand,UTTAR KASHI,2010,Whole Year ,Onion,47,306)
(Uttarakhand,UTTAR KASHI,2010,Whole Year ,Tobacco,1,3)
(Uttarakhand,UTTAR KASHI,2011,Kharif ,Arhar/Tur,380,312)
(Uttarakhand,UTTAR KASHI,2011,Kharif ,Horse-gram,861,832)
(Uttarakhand,UTTAR KASHI,2011,Kharif ,Maize,462,577)
(Uttarakhand,UTTAR KASHI,2011,Kharif ,Other Kharif pulses,1818,1330)
(Uttarakhand,UTTAR KASHI,2011,Kharif ,Potato,2449,17437)
(Uttarakhand,UTTAR KASHI,2011,Kharif ,Ragi,5388,9990)
(Uttarakhand,UTTAR KASHI,2011,Kharif ,Rice,10619,17165)
(Uttarakhand,UTTAR KASHI,2011,Kharif ,Sesamum,673,169)
(Uttarakhand,UTTAR KASHI,2011,Kharif ,Small millets,3741,4693)
(Uttarakhand,UTTAR KASHI,2011,Kharif ,Soyabean,414,422)
(Uttarakhand,UTTAR KASHI,2011,Kharif ,Sunflower,1,)
(Uttarakhand,UTTAR KASHI,2011,Kharif ,Urad,816,851)
(Uttarakhand,UTTAR KASHI,2011,Rabi ,Barley,174,246)
(Uttarakhand,UTTAR KASHI,2011,Rabi ,Gram,1,1)
(Uttarakhand,UTTAR KASHI,2011,Rabi ,Masoor,244,178)
(Uttarakhand,UTTAR KASHI,2011,Rabi ,Peas & beans (Pulses),347,228)
(Uttarakhand,UTTAR KASHI,2011,Rabi ,Potato,86,543)
(Uttarakhand,UTTAR KASHI,2011,Rabi ,Rapeseed &Mustard,904,497)
(Uttarakhand,UTTAR KASHI,2011,Rabi ,Wheat,11503,18907)
(Uttarakhand,UTTAR KASHI,2011,Whole Year ,Garlic,21,74)
(Uttarakhand,UTTAR KASHI,2011,Whole Year ,Ginger,2,20)
(Uttarakhand,UTTAR KASHI,2011,Whole Year ,Onion,8,52)
(Uttarakhand,UTTAR KASHI,2011,Whole Year ,Tobacco,1,1)
(Uttarakhand,UTTAR KASHI,2012,Kharif ,Arhar/Tur,360,316)
(Uttarakhand,UTTAR KASHI,2012,Kharif ,Horse-gram,692,623)
(Uttarakhand,UTTAR KASHI,2012,Kharif ,Maize,588,609)
(Uttarakhand,UTTAR KASHI,2012,Kharif ,Other Kharif pulses,1575,1098)
(Uttarakhand,UTTAR KASHI,2012,Kharif ,other oilseeds,5,1)

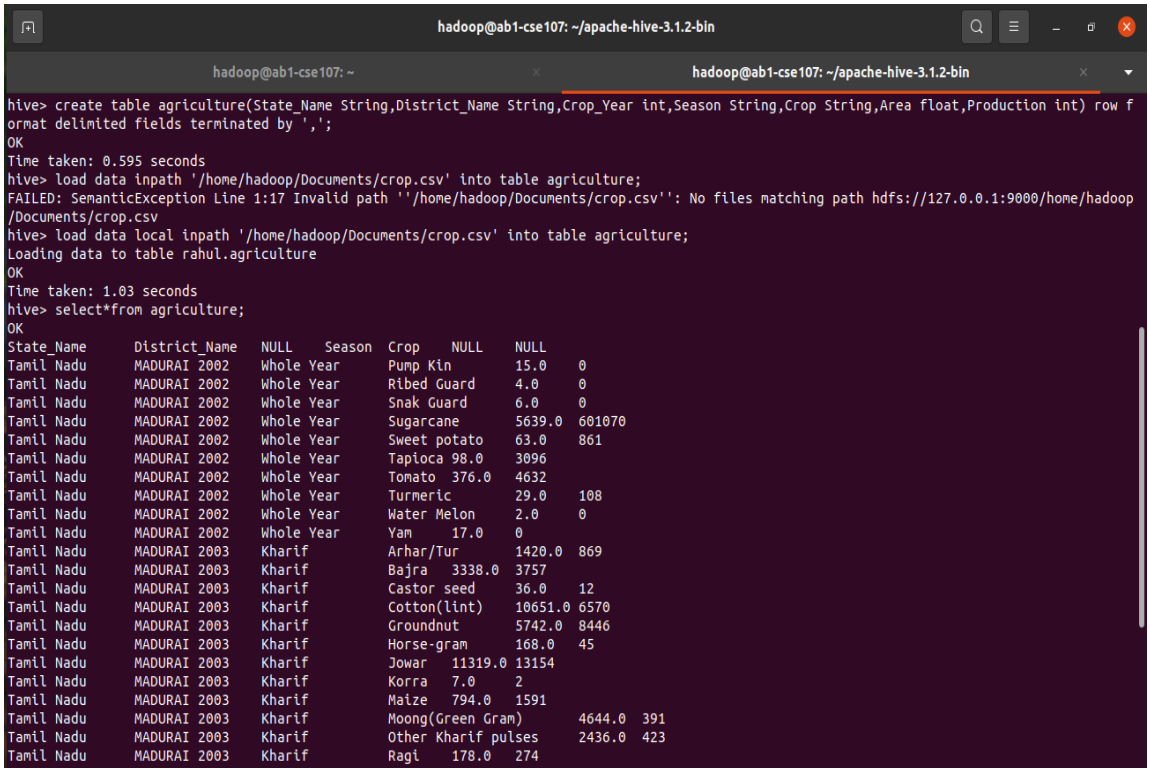

hadoop@ab1-cse107: ~
(Tamil Nadu,MADURAI,1997,Kharif ,Horse-gram,117,60)
(Tamil Nadu,MADURAI,1997,Kharif ,Onion,1109,7011)
(Tamil Nadu,MADURAI,1997,Kharif ,Sesamum,2403,550)
(Tamil Nadu,MADURAI,1997,Kharif ,Small millets,1105,1150)
(Tamil Nadu,MADURAI,1997,Whole Year ,Arhar/Tur,1498,750)
(Tamil Nadu,MADURAI,1997,Whole Year ,Bajra,1020,1290)
(Tamil Nadu,MADURAI,1997,Whole Year ,Banana,2077,139430)
(Tamil Nadu,MADURAI,1997,Whole Year ,Cashewnut,232,140)
(Tamil Nadu,MADURAI,1997,Whole Year ,Coriander,253,120)
(Tamil Nadu,MADURAI,1997,Whole Year ,Cotton(lint),13061,8580)
(Tamil Nadu,MADURAI,1997,Whole Year ,Dry chillies,505,370)
(Tamil Nadu,MADURAI,1997,Whole Year ,Gram,19,10)
(Tamil Nadu,MADURAI,1997,Whole Year ,Groundnut,11983,16580)
(Tamil Nadu,MADURAI,1997,Whole Year ,Jowar,9626,8860)
(Tamil Nadu,MADURAI,1997,Whole Year ,Maize,306,620)
(Tamil Nadu,MADURAI,1997,Whole Year ,Moong(Green Gram),5158,1610)
(Tamil Nadu,MADURAI,1997,Whole Year ,Pulses total,10273,3400)
(Tamil Nadu,MADURAI,1997,Whole Year ,Ragi,298,720)
(Tamil Nadu,MADURAI,1997,Whole Year ,Rice,83061,314380)
(Tamil Nadu,MADURAI,1997,Whole Year ,Small millets,720,20)
(Tamil Nadu,MADURAI,1997,Whole Year ,Sugarcane,8108,18223000)
(Tamil Nadu,MADURAI,1997,Whole Year ,Sunflower,967,860)
(Tamil Nadu,MADURAI,1997,Whole Year ,Sweet potato,93,1350)
(Tamil Nadu,MADURAI,1997,Whole Year ,Tapioca,56,2100)
(Tamil Nadu,MADURAI,1997,Whole Year ,Total foodgrain,109708,332710)
(Tamil Nadu,MADURAI,1997,Whole Year ,Turmeric,7,40)
(Tamil Nadu,MADURAI,1997,Whole Year ,Urad,1248,580)
(Tamil Nadu,MADURAI,1998,Kharif ,Arhar/Tur,4055,4465)
(Tamil Nadu,MADURAI,1998,Kharif ,Bajra,3412,6225)
(Tamil Nadu,MADURAI,1998,Kharif ,Cotton(lint),17147,26970)
(Tamil Nadu,MADURAI,1998,Kharif ,Groundnut,14722,25578)
(Tamil Nadu,MADURAI,1998,Kharif ,Horse-gram,153,77)
(Tamil Nadu,MADURAI,1998,Kharif ,Jowar,12744,14981)
(Tamil Nadu,MADURAI,1998,Kharif ,Maize,1025,2066)
(Tamil Nadu,MADURAI,1998,Kharif ,Moong(Green Gram),13040,7159)
(Tamil Nadu,MADURAI,1998,Kharif ,Pulses total,26613,14426)
(Tamil Nadu,MADURAI,1998,Kharif ,Ragi,229,408)
(Tamil Nadu,MADURAI,1998,Kharif ,Rice,88338,303471)

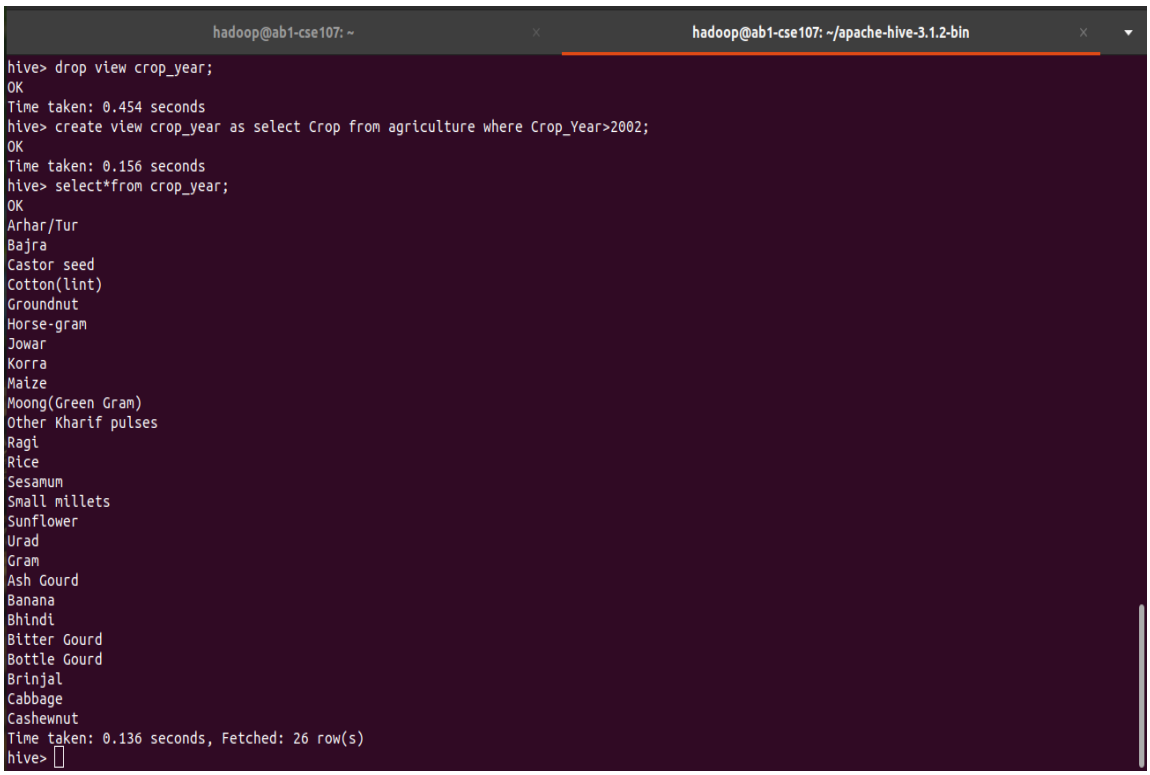

hadoop@ab1-cse107: ~
(Pulses total)
(Rice)
(Sesamum)
(Soyabean)
(Sugarcane)
(Total foodgrain)
(Urad)
(Barley)
(Gram)
(Lentil)
(Masoor)
(other oilseeds)
(Peas & beans (Pulses))
(Potato)
(Pulses total)
(Rapeseed &Mustard)
(Total foodgrain)
(Wheat)
(Maize)
(Moong(Green Gram))
(Pulses total)
(Rice)
(Total foodgrain)
(Urad)
(Pulses total)
(Rice)
(Sunflower)
(Total foodgrain)
(Turmeric)
(Arhar/Tur)
(Horse-gram)
(Maize)
(Other Cereals & Millets)
(Other Kharif pulses)
(Potato)
(Ragi)
(Rice)
(Sesamum)

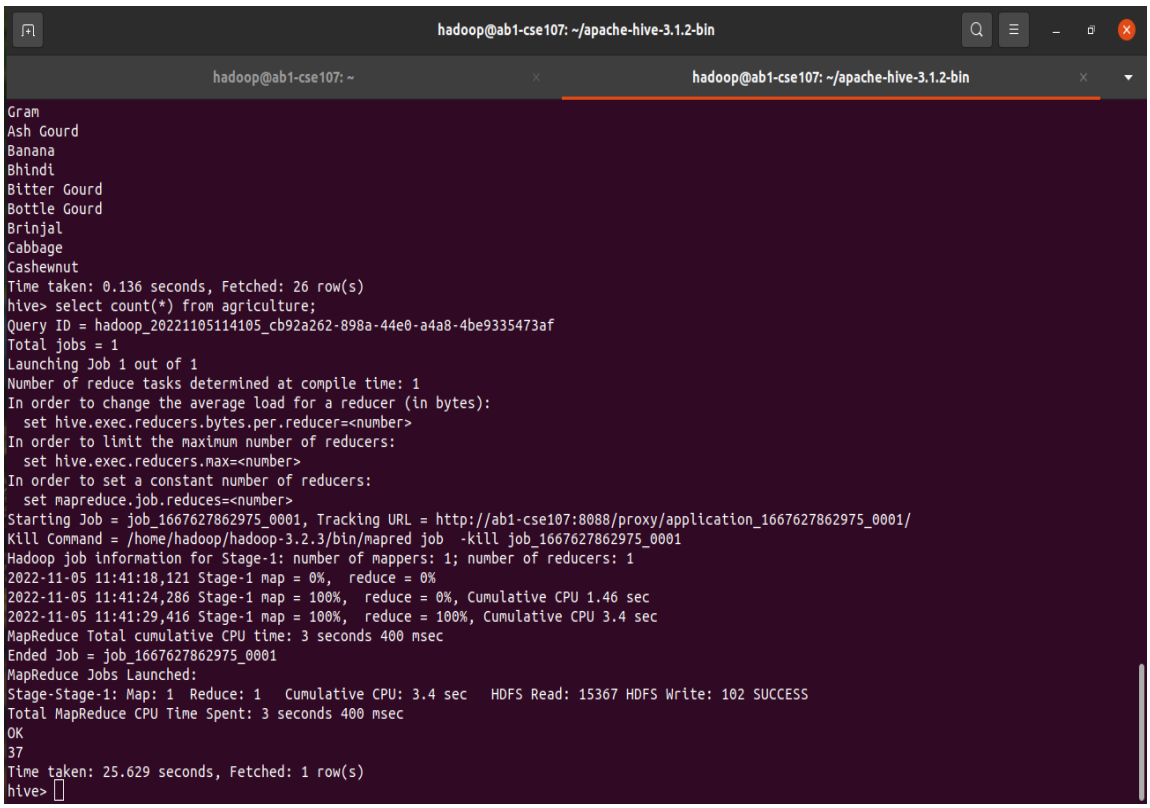
Hive commands:

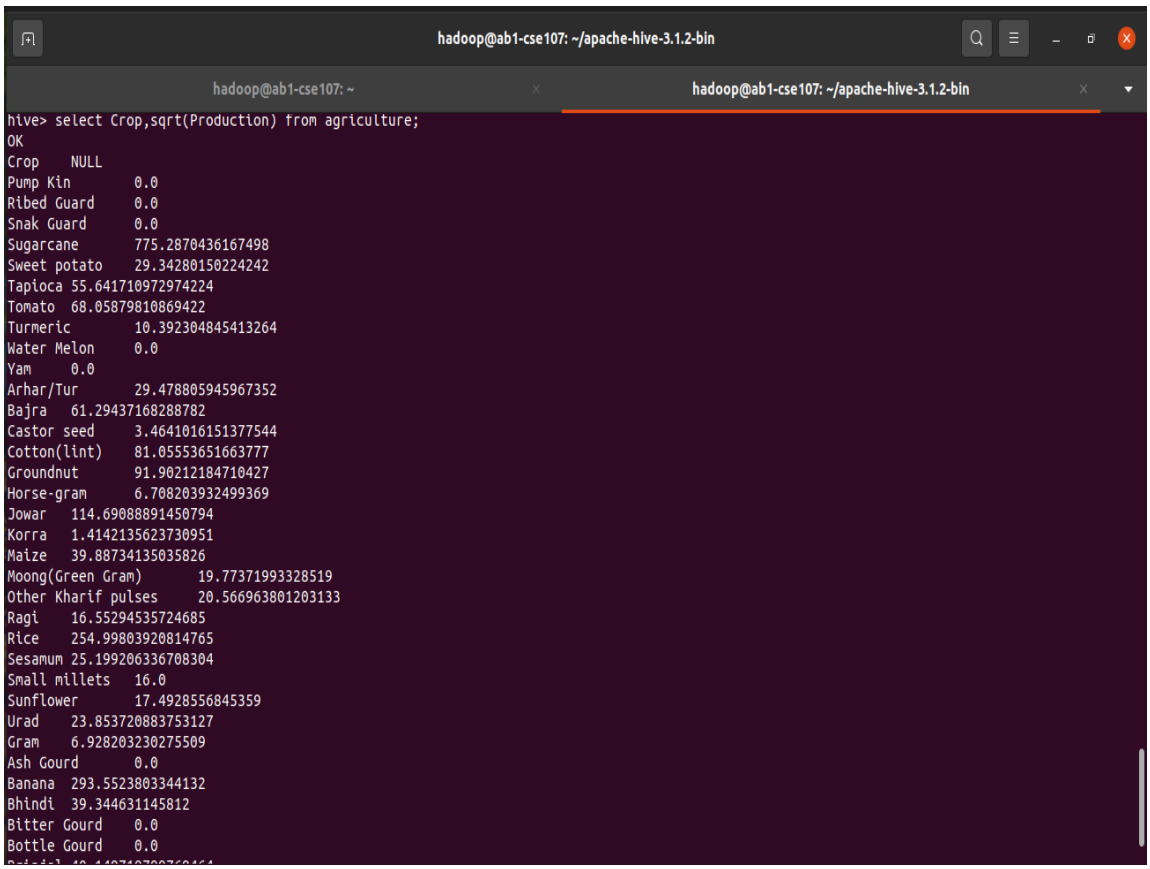
```
create database Rahul;

use Rahul;

create table agriculture(State_Name String,District_Name String,Crop_Year int,Season String,Crop String,Area float,Production int) row format delimited fields terminated by ',';

load data local inpath '/home/hadoop/Documents/crop.csv' into table agriculture;

select*from agriculture;

create view crop_year as select Crop from agriculture where Crop_Year>2002;

select*from crop_year;

select count(*) from agriculture;

select State_Name,lower(District_Name) from agriculture;

select Crop,sqrt(Production) from agriculture;

select max(Production) from agriculture;
```

Output:


hadoop@ab1-cse107: ~/apache-hive-3.1.2-bin
hadoop@ab1-cse107: ~
hadoop@ab1-cse107: ~/apache-hive-3.1.2-bin
hive> create table agriculture(State_Name String,District_Name String,Crop_Year int,Season String,Crop String,Area float,Production int) row format delimited fields terminated by ',';
OK
Time taken: 0.595 seconds
hive> load data inpath '/home/hadoop/Documents/crop.csv' into table agriculture;
FAILED: SemanticException Line 1:17 Invalid path ''/home/hadoop/Documents/crop.csv'': No files matching path hdfs://127.0.0.1:9000/home/hadoop/Documents/crop.csv
hive> load data local inpath '/home/hadoop/Documents/crop.csv' into table agriculture;
Loading data to table rahul.agriculture
OK
Time taken: 1.03 seconds
hive> select*from agriculture;
OK
State_Name District_Name NULL Season Crop NULL NULL
Tamil Nadu MADURAI 2002 Whole Year Pump Kin 15.0 0
Tamil Nadu MADURAI 2002 Whole Year Ribed Guard 4.0 0
Tamil Nadu MADURAI 2002 Whole Year Snak Guard 6.0 0
Tamil Nadu MADURAI 2002 Whole Year Sugarcane 5639.0 601070
Tamil Nadu MADURAI 2002 Whole Year Sweet potato 63.0 861
Tamil Nadu MADURAI 2002 Whole Year Tapioca 98.0 3096
Tamil Nadu MADURAI 2002 Whole Year Tomato 376.0 4632
Tamil Nadu MADURAI 2002 Whole Year Turmeric 29.0 108
Tamil Nadu MADURAI 2002 Whole Year Water Melon 2.0 0
Tamil Nadu MADURAI 2002 Whole Year Yam 17.0 0
Tamil Nadu MADURAI 2003 Kharif Arhar/Tur 1420.0 869
Tamil Nadu MADURAI 2003 Kharif Bajra 3338.0 3757
Tamil Nadu MADURAI 2003 Kharif Castor seed 36.0 12
Tamil Nadu MADURAI 2003 Kharif Cotton(lint) 10651.0 6570
Tamil Nadu MADURAI 2003 Kharif Groundnut 5742.0 8446
Tamil Nadu MADURAI 2003 Kharif Horse-gram 168.0 45
Tamil Nadu MADURAI 2003 Kharif Jowar 11319.0 13154
Tamil Nadu MADURAI 2003 Kharif Korra 7.0 2
Tamil Nadu MADURAI 2003 Kharif Maize 794.0 1591
Tamil Nadu MADURAI 2003 Kharif Moong(Green Gram) 4644.0 391
Tamil Nadu MADURAI 2003 Kharif Other Kharif pulses 2436.0 423
Tamil Nadu MADURAI 2003 Kharif Ragi 178.0 274


hadoop@ab1-cse107: ~
hadoop@ab1-cse107: ~/apache-hive-3.1.2-bin
hive> drop view crop_year;
OK
Time taken: 0.454 seconds
hive> create view crop_year as select Crop from agriculture where Crop_Year>2002;
OK
Time taken: 0.156 seconds
hive> select*from crop_year;
OK
Arhar/Tur
Bajra
Castor seed
Cotton(lint)
Groundnut
Horse-gram
Jowar
Korra
Maize
Moong(Green Gram)
Other Kharif pulses
Ragi
Rice
Sesamum
Small millets
Sunflower
Urad
Gram
Ash Gourd
Banana
Bhindi
Bitter Gourd
Bottle Gourd
Brinjal
Cabbage
Cashewnut
Time taken: 0.136 seconds, Fetched: 26 row(s)
hive>


hadoop@ab1-cse107: ~/apache-hive-3.1.2-bin
hadoop@ab1-cse107: ~
hadoop@ab1-cse107: ~/apache-hive-3.1.2-bin
Gram
Ash Gourd
Banana
Bhindi
Bitter Gourd
Bottle Gourd
Brinjal
Cabbage
Cashewnut
Time taken: 0.136 seconds, Fetched: 26 row(s)
hive> select count(*) from agriculture;
Query ID = hadoop_20221105114105_cb92a262-898a-44e0-a4a8-4be9335473af
Total jobs = 1
Launching Job 1 out of 1
Number of reduce tasks determined at compile time: 1
In order to change the average load for a reducer (in bytes):
set hive.exec.reducers.bytes.per.reducer=<number>
In order to limit the maximum number of reducers:
set hive.exec.reducers.max=<number>
In order to set a constant number of reducers:
set mapreduce.job.reduces=<number>
Starting Job = job_1667627862975_0001, Tracking URL = http://ab1-cse107:8088/proxy/application_1667627862975_0001/
Kill Command = /home/hadoop/hadoop-3.2.3/bin/mapred job -kill job_1667627862975_0001
Hadoop job information for Stage-1: number of mappers: 1; number of reducers: 1
2022-11-05 11:41:18,121 Stage-1 map = 0%, reduce = 0%
2022-11-05 11:41:24,286 Stage-1 map = 100%, reduce = 0%, Cumulative CPU 1.46 sec
2022-11-05 11:41:29,416 Stage-1 map = 100%, reduce = 100%, Cumulative CPU 3.4 sec
MapReduce Total cumulative CPU time: 3 seconds 400 msec
Ended Job = job_1667627862975_0001
MapReduce Jobs Launched:
Stage-Stage-1: Map: 1 Reduce: 1 Cumulative CPU: 3.4 sec HDFS Read: 15367 HDFS Write: 102 SUCCESS
Total MapReduce CPU Time Spent: 3 seconds 400 msec
OK
37
Time taken: 25.629 seconds, Fetched: 1 row(s)
hive>


hadoop@ab1-cse107: ~/apache-hive-3.1.2-bin
hadoop@ab1-cse107: ~
hadoop@ab1-cse107: ~/apache-hive-3.1.2-bin
hive> select Crop,sqrt(Production) from agriculture;
OK
Crop NULL
Pump Kin 0.0
Ribed Guard 0.0
Snak Guard 0.0
Sugarcane 775.2870436167498
Sweet potato 29.34280150224242
Tapioca 55.641710972974224
Tomato 68.05879810869422
Turmeric 10.392304845413264
Water Melon 0.0
Yam 0.0
Arhar/Tur 29.478805945967352
Bajra 61.29437168288782
Castor seed 3.4641016151377544
Cotton(lint) 81.05553651663777
Groundnut 91.90212184710427
Horse-gram 6.708203932499369
Jowar 114.69088891450794
Korra 1.4142135623730951
Maize 39.88734135035826
Moong(Green Gram) 19.77371993328519
Other Kharif pulses 20.566963801203133
Ragi 16.55294535724685
Rice 254.99803920814765
Sesamum 25.199206336708304
Small millets 16.0
Sunflower 17.4928556845359
Urad 23.853720883753127
Gram 6.928203230275509
Ash Gourd 0.0
Banana 293.5523803344132
Bhindi 39.344631145812
Bitter Gourd 0.0
Bottle Gourd 0.0