Kshitiz Kharel

Dr. Han Reichtgelt

ISM 6930 : Data Visualization

May 3, 2020

Research on Arabica Coffee

Introduction

Coffee is one of the major cash crops that is traded worldwide. Coffee comes 2nd in the most traded commodity in the world after oil and is the 4th most consumed beverage in the world. So, it has a major impact on the global economy. In year 2020, approximately 7 billion kgs of coffee were exported from all the coffee exporting countries. In the year 2015, the total impact of the coffee industry in the United States alone was $225.2 billion. And this industry is responsible for million jobs in the United States. There are 2 major types of coffee beans that are traded worldwide Coffee Arabica and Coffee Robusta. This research focuses on Arabica Coffee.

Major Arabica coffee producing countries are Brazil, Colombia, Ethiopia, and Honduras. These countries have dominated the global market since the 1950's. In Brazil, Coffee is responsible for 10% of GDP and in other countries as well, coffee has played a major role in the economy. Coffee farmers are the major groups that are responsible for the contribution of the economy. This project aims to find the status of the production and exports of the Arabica Coffee for different countries. This project aims to find if there are any disparities in the prices paid to the farmers.

Furthermore, the coffee quality is one of the major reasons for some countries coffee exports being more than other countries. Coffees of different altitudes taste different. This research also aims to

answer if the altitude has an impact on the quality of Arabica in Arabica producing countries. Based on this, the following research questions have been derived.

Research Questions

1) What is the production and export for different Arabica Coffee producing countries and impact of price paid to the farmers on production and export?
2) What is the impact of altitude on the arabica coffee quality in arabica Coffee producing countries?

Methodology

The data used for this research project was sourced from International Coffee Organization (ICO). ICO is an intergovernmental organization for coffee, bringing together exporting and importing Governments to tackle the challenges facing the world coffee sector through international cooperation. Historical Data on the Global Coffee Trade on the ICO website was used to get the data. ICO contains data from 1990 – 2019 on various aspects that is free to use. However, for this project, the data from 2009-2019 were used. The data was in excel file and the data that were used for this project were:

-Production

-Prices Paid to Growers

-Imports

Furthermore, since, the purpose of this project was to know the impact of altitude in the Arabica coffee quality in arabica producing countries, various quality factors of Arabica coffee such as Acidity, Aroma, Balance, Moisture, Aftertaste, Flavor were measured. For this purpose, the data was collected from

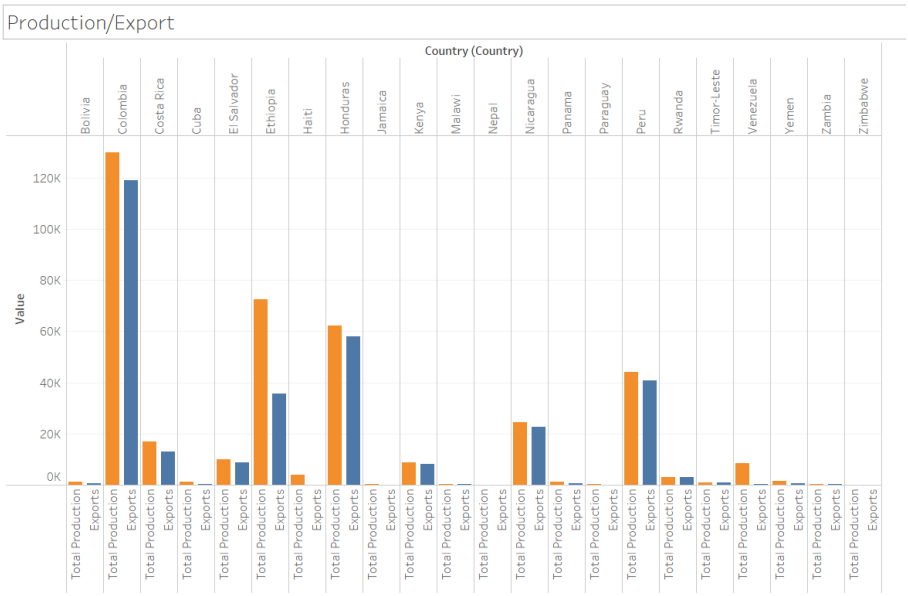
Kaggle website. The data is titled “Coffee Quality Database from CQI” and the data has been scrapped from the Coffee Quality Institute (CQI) website. This dataset contains reviews of Arabica and Robusta Coffee beans from the CQI’s trained reviewers. The reviews are from 0-10 and where 10 is the highest rating. Since, the project only focuses on Arabica Coffee, only the reviews of Arabica Coffee were used.

Data from CQI contains data from 2009 -2019. Although, the data from ICO contained free to use data from 1990-2019, for the purpose of data consistency, data from 2009-2019 is used in this project. Further, ICO contains data for only Arabica Coffee producing Countries labelled as (A), only Robusta Coffee producing countries labelled as (R) and mix of Robusta and Arabica producing countries(R/A). This project only focuses on Arabica coffee producing countries. Prices paid to growers had many null values, so the prices paid to growers have only been included for top 4 Arabica coffee producing countries.

There were other few limitations on the dataset. Data Consistency is one major factor for the limitation. ICO website data was labelled for different countries as mentioned above, A for Arabica, R for Robusta, (A/R) for mix of both. Brazil is the top Arabica Coffee producer, however there is no separation for the quantity of Arabica and Robusta coffee produced and exported by Brazil. So, to ensure the data integrity Brazil has not been included in the project. Tableau was used as a major tool to create the visualization and make the analysis. The data was not ready to import to the Tableau interface. The data had to be cleaned. For the cleaning process, excel was used.

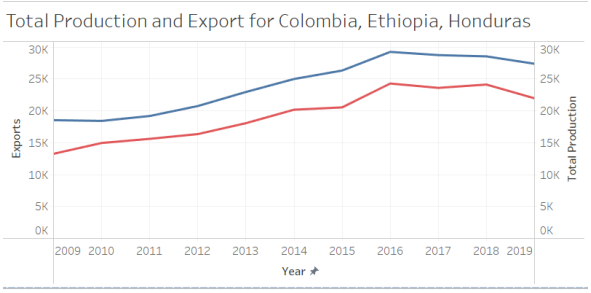
Analysis

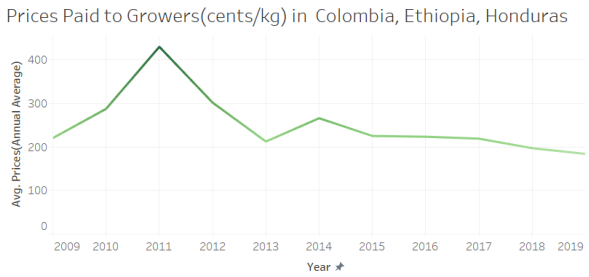
Global Production and Export of Arabica coffee from 2009-2019.



The data was sourced from Production and Export excel files that were available from ICO website. To compare the total production and exports for different countries from 2009-2019, clustered column chart has been used. The figures above show the global productions and exports of the arabica coffee from 2009-2019 in thousand 60 kg bags. Colombia is the highest producer and exporter of Arabica Coffee amongst the studied Countries whereas Nepal is the lowest producer and exports lowest amount of Arabica Coffee worldwide. Colombia has produced 130,091 thousand 60 kg Bags and exported 119,180 thousand 60 kg Bags in 10-year period. Ethiopia comes in 2nd amongst the countries for production, however, the export from Ethiopia is almost half of its production. Honduras which is the third largest producer of Arabica Coffee amongst the countries studied the export of Honduras surpasses the export of Ethiopia.

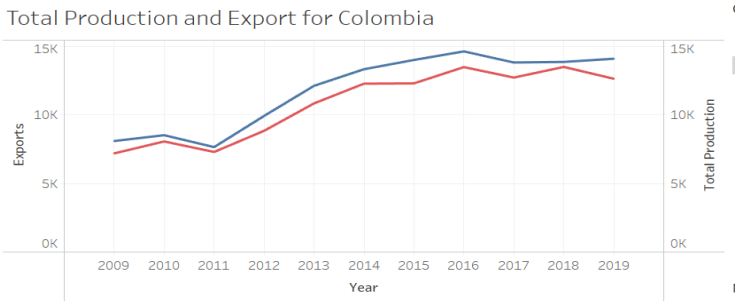
Coffee Production and Export and prices paid to growers from 2009-2019 for 3 Arabica producing countries

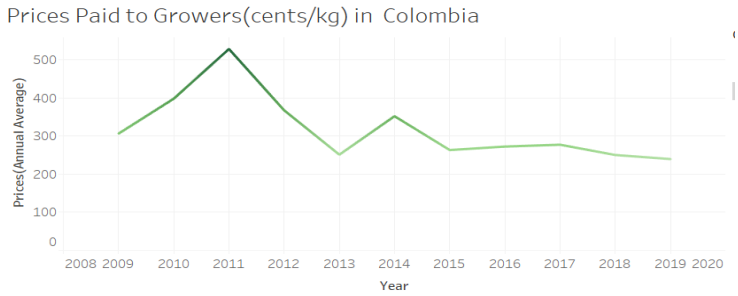




The coffee production and export had gradually increased from 2009 to till 2016 for top 3 arabica coffee producers, i.e. Colombia, Ethiopia and Honduras. After 2016, the production and export has started to decrease. With the decrease in the production and export we can see that Prices that is paid to growers is decreasing as well. However, we can see an interesting pattern for the prices paid to the growers in 2011. This price is the highest yet coffee growers on average have received. Colombia is one of the largest producer and exporter of Arabica Coffee. However, all the coffee farmers, in terms of price, benefitted from the natural disaster as the global demand of the coffee was not met with the disruption in the supply which eventually led the farmers to earn more by selling the coffee which were not destroyed during the natural disaster. Other factors contributing to the increasing coffee prices are also the rising prices for fuel and fertilizers, weak US dollar, and speculation in the coffee bean market.

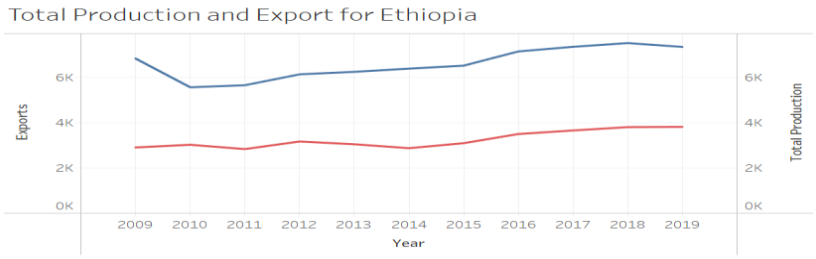
Colombian Production and Export and prices paid to growers from 2009-2019

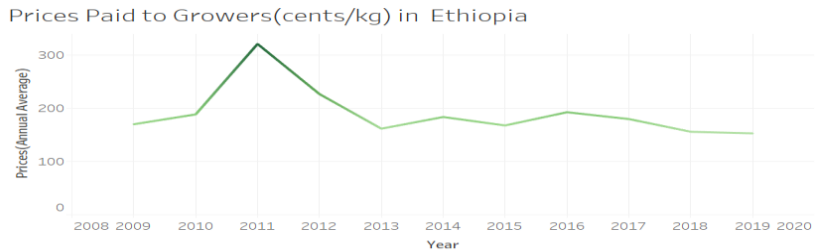




Colombian coffee production and export was reached low in 2011. This is because of the flood that occurred in that year. The growers on average earned more than 5$/kg during year 2011 although the country had low export. The high demand and the limited supply led to the increase in the coffee worldwide and eventually growers on average earned more in 2011 than in any other years. The situation was short lived and eventually the coffee price got down to about 2.5$ in 2013. From the Colombian Export and prices paid to the growers we can see that the production and export is increasing over the years after 2011 but, the price paid to the growers is decreasing.

Ethiopian Production and Export and prices paid to growers from 2009-2019

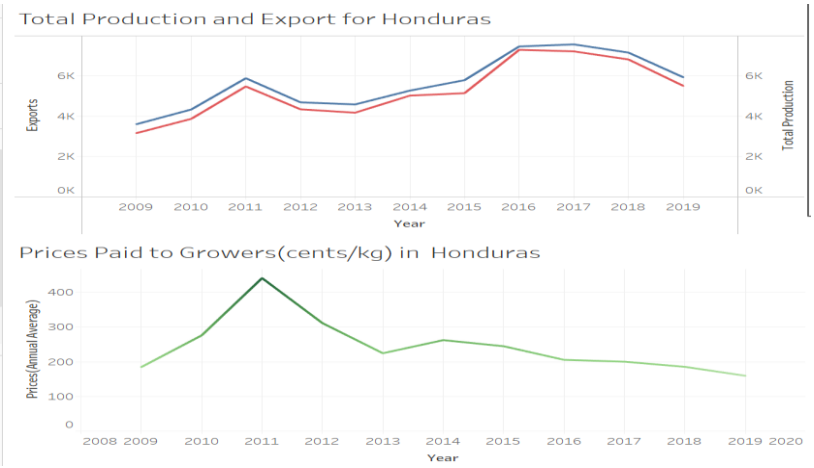




Most of the production of coffee gets consumed domestically as we can see from the graph. Ethiopian coffee production and export is almost stagnant throughout the years from 2009-2011. The price paid to the farmers is almost stagnant with an exception in 2011. The reason for the

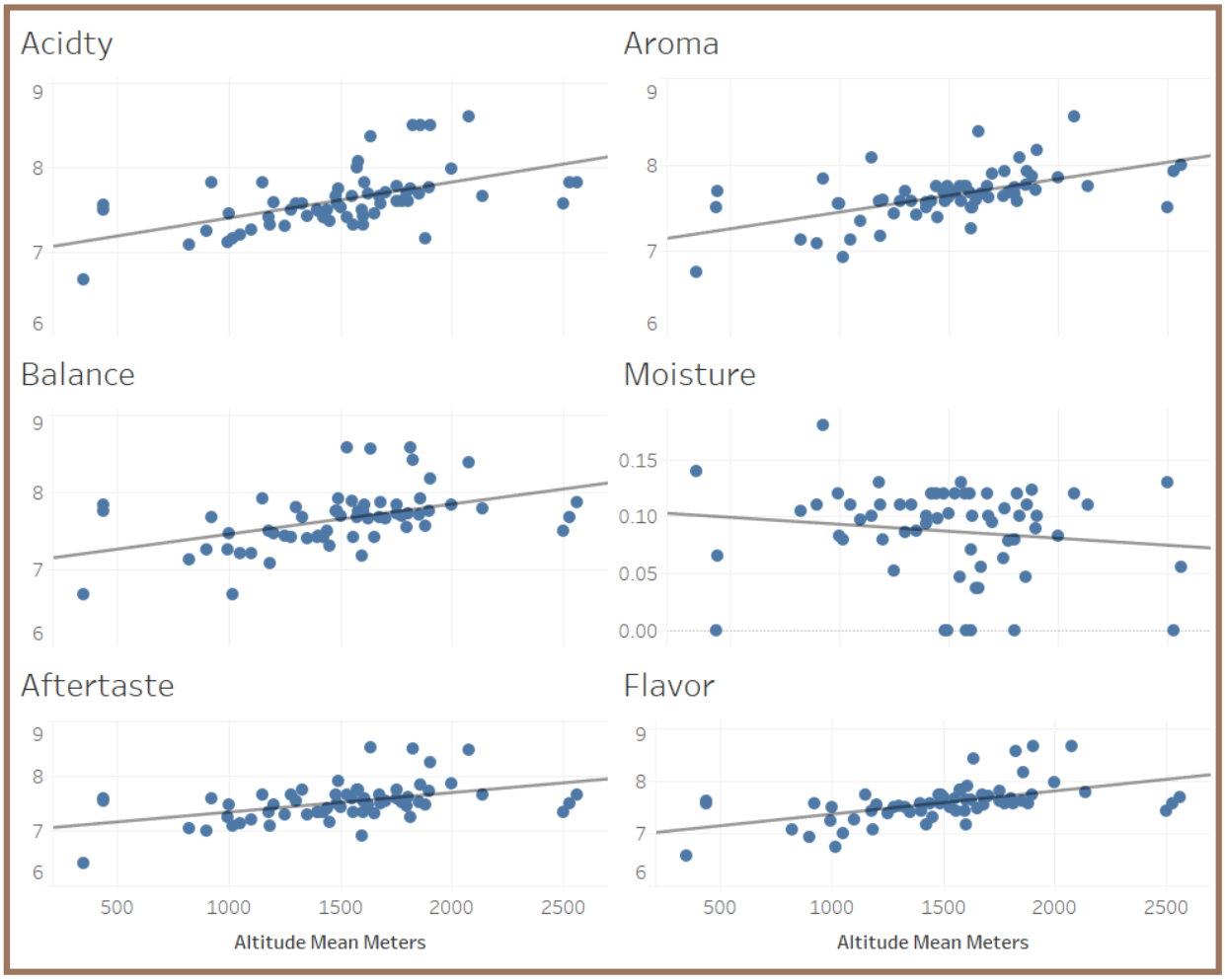
huge gap between production and Export in Ethiopia is because of the exploitative domestic and global market system in Ethiopia. The chain for Coffee Export consists of farmers, brokers, small and big buyers and finally exporters. At each point in the value chain, farmers have lost the value for their product. And, since the farmers have been exploited from the members in the value chains, the money they receive from the coffee is in decreasing trend.

Honduras Production and Export and prices paid to growers from 2009-2019



Honduras is the 6th largest arabica coffee exporter worldwide. We can see that almost all coffee that is produced in Honduras is exported. But, after 2016, the production and export are starting to fall. We can see that the price paid to the growers is decreasing as well. Honduras is one of the countries where the farmers are paid very low. Intense price pressure to the farmers has pushed many farmers to abandon the coffee farms which we can see from the decreasing prices paid to the growers graph. Other marker factors resulting in the lower production are low number of pickers, changing climate condition. Since arabica coffee grows up in higher altitude, the transportation, although insignificant, has also been one of the reasons.

Impact of altitude on Arabica coffee of Arabica Coffee Exporting Countries.



The project aimed to find the impact of altitude in the various quality measures of coffee. From above diagram, we can see that Arabica Coffee Mostly grows in the altitude of about 450 meters to 2600 meters. And various measures for the arabica coffee such as Acidity, Aroma, Balance, Moisture, Aftertaste, and flavor have been plotted with Altitude as the X-axis. From the graph we can see that almost all the variables have an impact of altitude on Arabica Coffee except for Moisture. The moisture on the coffee is not correlated to the altitude for Arabica Coffee.

Conclusion

According to this research of the countries studied for the period, the production and exports for Arabica coffee globally is increasing. The production for Arabica Coffee in 2009 was 29345 thousand 60 kg bags and in 2019, with 32.96% increase it has reached to 39018 thousand 60 kg bags. Similar is the trend for the export. In 2009, the global export was 21230 thousand 60 kg bags and in 2019 with 46.39% increase reached to 30179 thousand 60 kg bags. But, from 2018 to 2019 the production and export has decreased overall. Further, going forward COVID occurred, which might have further disrupted the production and export globally. This project is constrained because of the unavailability of the data after 2019. Although the production and export shows increasing tendency, the prices paid to the farmers scenario is different. It is in decreasing trend. Upon further analysis on top 3 different Arabica producing countries encompassed on the study, we can see that the prices paid to the farmers on average is decreasing. In countries such as Honduras and Ethiopia which is amongst the largest coffee producers, the farmers have been exploited. The government of the Coffee Producing countries can introduce reforms to increase the production and export by introducing fair pricing to the farmers.

Altitude is an important factor for the quality of Arabica coffee. This researched aimed to find the correlation between altitude and coffee quality in Arabica Coffee producing countries included in the study. There seems to be a positive correlation between the altitude and the different quality measures except for the moisture. With increasing altitude, the quality of the coffee is increasing.

Because of the data constraints, there are various analysis that were constrained in this research project. This research only focused on Arabica Coffee. Moving forward, the study can be done for Robusta Coffee as well. Some of the research questions going forward and with availability of data are:

1) Production and exports trend after 2019 and the factors that is impacting on the decrease of the exports of Coffee in some largest coffee producing countries.

2) What is the impact of coffee quality measures on the production and exports of the coffee?

References:

https://www.aa.com.tr/en/africa/ethiopias-coffees-are-special-but-not-their-prices/2379360

https://www.theguardian.com/business/2011/apr/21/commodities-coffee-shortage-price-rise-expected

https://scanews.coffee/2011/10/21/whats-behind-rising-coffee-prices/

https://www.ico.org/new_historical.asp?section=Statistics

https://www.kaggle.com/datasets/volpatto/coffee-quality-database-from-cqi

https://database.coffeeinstitute.org/