A Study to Investigate the Impact of Imports on Agricultural Food Products in Nepal

Hari Prashad Joshi

A Thesis Submitted in Fulfillment of the Requirements for the Degree of Doctor of Philosophy in Sustainable Energy Management (International Program)
Prince of Songkla University
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Author	Mr. Hari Prashad Joshi
Major Program	Sustainable Energy Management (International Program)

Major Advisor

.....
(Assoc. Prof. Dr. Khamphe Phoungthong)

Examining Committee:

.....Chairperson
(Asst. Prof. Dr. Jiraporn Chomanee)

.....Committee
(Assoc. Prof. Dr. Khamphe Phoungthong)

.....Committee
(Dr. Thitipone Suwanwong)

.....Committee
(Assoc. Prof. Dr. Kuaanan Techato)

.....Committee
(Assoc. Prof. Dr. Suchada Chantrapromma)

The Graduate School, Prince of Songkla University, has approved this thesis as fulfillment of the requirements for the Doctor of Philosophy Degree in Sustainable Energy Management (International Program)

.....
(Asst. Prof. Dr. Thakerng Wongsirichot)
Acting Dean of Graduate School

This is to certify that the work here submitted is the result of the candidate's own investigations. Due acknowledgement has been made of any assistance received.

.....Signature
(Assoc. Prof. Dr. Khamphe Phoungthong)
Major Advisor

.....Signature
(Mr. Hari Prashad Joshi)
Candidate

I hereby certify that this work has not been accepted in substance for any degree, and is not being currently submitted in candidature for any degree.

.....Signature
(Mr. Hari Prashad Joshi)
Candidate

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ABSTRACT

Nepal is a south Asian agricultural country that is topographically isolated between mountains, hills, and the terai, and from them, 35% of the total area is covered by mountains and 42% is by hills and 23% is covered by mountains. It is arranged as a trapezoidal shape 870 km in length and 130 km in width. The total area covered by Nepal is 147181 sq. km. Two third of the total population i.e. 66% (Based on a 2021 economic survey) of the total population is engaged in agriculture as their main source of income and contributes 21.32% (Based on a 2021 economic survey) of the gross domestic product. But still, Nepal is facing a huge loss in agricultural business each year which has a very big impact on the overall economy of Nepal.

To minimize the trade loss there is a need for maximum utilization of available resources in Nepal by increasing the productivity for the improvement of the export side and decreasing the importing side in Nepal. Nepal Rastra Bank which is also known as the Bank of the Bank in Nepal has categorized Paddy, Maize, Wheat, Millet, and Barley as agricultural food products. The five products are also known as cereal food products. In Nepali they are known as अनाज खाद्य पदार्थ. In Nepal, the natural impact of ecological diseases and natural disasters has hugely affected the production of agricultural food production.

Most of the studies in the literature are concerned with the issues of gender, climate, international relation, and social issues but there, have been no studies on the impact of imports on the development of the nation and what trend Nepal's International trade is going and the impact of that trend in the future on the development of the nation. The researcher has not focused to find the main reason for increasing imports each year and the impact of increased imports on the economic condition of Nepal. If those problems

are identified that there the government has to take immediate action and have to find an alternative solution for the increment of trade loss each year. If those problems will timely be resolved then the international trade balance will contribute to the development of the economic condition of Nepal.

The data on production, productivity, cultivated land, fertilizer used, Government outstanding, and foreign currency reserves are collected from Nepal Rastra Bank which is also known as a central bank authorized by Nepal Government. First, a geographical representation of data spanning 40 years is employed to determine the trend of Nepalese agricultural food product production status. The fundamental parameters of output, productivity, and cultivated land were described using descriptive statistics. The variable that was important and had an impact on those variables were then compared using correlation analysis.

The study noted that both the import and export are in an increasing trend but the increment of imports is higher than the increment of export. The trends also show the productivity for growing Nepali agricultural food products (Paddy, Maize, Millet, Wheat, and Barley) Paddy has a high productivity rate followed by Maize, Wheat, Barley, and Millet respectively. Barley has the lowest production rate but consumed more than ten times the cultivated land which also creates a problem in the productivity of overall agricultural food productivity in Nepal. Nepal is currently facing huge trade losses due to imports and in the future Nepal willfully of depending the need for demand so, the timely implementation of the solution will reduce trade loss in Nepal. Nepal's agricultural food production has an important role in foreign trade and to control the trade loss in Nepal. Agricultural production has contributed 26% of the total GDP and 66% of the total population depends on this sector. The production has a direct relation to the government's outstanding and foreign currency reserves.

This study also has made an effort to investigate the determinants of the production of agricultural food products in Nepal taking electricity generation, annual mean temperature, foreign exchange rate, and imports of agricultural food products as the independent variable by the use of the Auto Regressive Distributed Lag Model. The data analysis from 1990 to 2019 showed that electricity generation and foreign exchange rate have a positive impact on cereal production whereas, cultivated area and

the annual mean temperature have a negative impact and will hurt agricultural food products in Nepal. Production of agricultural food products has been forecasted till 2060 based on the four scenarios developed based on production growth rate.

Climate change has a huge impact on the production of agricultural food products in Nepal. Due to the excess use of fertilizer, the problem like misfortune of soli richness, a reserve of nutrients has been depletion, loss of fertilizer land, loss of crops, loss of wild plants and animals, loss of the capacity of the natural resources, development of the new diseases are wisely seen due the issue of the fertilizer consumption in Nepal. The production of agricultural food products has played an important role in the trade balance in Nepal. Although the trend of importing is not in the favor of the economy of Nepal and needs to correct on time. The import has a direct relation with the government outstanding because the increment in the Import has increased the government outstanding of Nepal which has also impacted the reserve of the foreign currency of Nepal. There is a need to search the alternative and substitute products in Nepal which will help to maintain the trade balance in Nepal. I will recommend to the policy maker to focus on paddy production in Nepal which will provide great benefits to reducing trade loss and will benefit the economic development of the nation.

Keywords: Agricultural Food Products, Nepal, Import, Cereal Crops, Trade Deficit, Electricity Generation, Annual Mean Temperature

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LIST OF ABBREVIATIONS

AFP – Agricultural Food Products

CBS – Core Banking System

CO2 – Carbon Dioxide

EU – European Union

FAO – Food and Agriculture Organization

FY – Fiscal Year

GDP – Gross Domestic Product

GDP – Gross Domestic Product

GNI – Gross National Income

H1 – Hypothesis one

IMF – International Monetary Fund

INGO – International Non-Government Organization

KM – Kilo Meter

MS – Microsoft

Mt – Meter

NGO – Non-Government Organization

NPR – Nepali Rupees

NRB – Nepal Rastra Bank

SDRs – Special Drawing Rights

SPSS – Statistical Packages for Social Sciences

UAE – United Arab Emirates

UK – United Kingdom

US – United States

USA – United States of America

USD – United State Dollar

WB – World Bank

WCED – World Commission on Environment and Development

WDI – World Development Indicators

WTO – World Trade Organization

CHAPTER I: INTRODUCTION

The agriculture segment plays an important role in Nepal's economy. Nearly two third of the population is engaged in the development of agriculture and contributes about one-third of the total Gross Domestic Product (Acharya et al., 2021). Exporting those products plays a very important role in the economic development of the nation. The production of local agricultural products seems to decrease each year, which hit Nepal's financial and environmental conditions. The result shows that there is a very strong and positive relationship between urbanization and the import of rice (Pudasainee et al., 2018). Before 1970 Nepal utilized to export rice to numerous nations but from that point, the consequences changed increasing the import of rice and decreasing the export. Nepal's trade policy does not straightforwardly mention foreign trade's natural environmental impacts (K. P. Pant, 2007). Neither this policy recognizes the issues of foreign trade on the environment. The environmental protection act (1997) does not have any reference to the natural problems relating to trade, imports, and export. So, there is a need to promote local agriculture production which will contribute not only economic condition of Nepal but also motivate Nepalese farmers and all the stakeholders of agricultural sectors in Nepal.

The research analyzing the impact of imports on local agricultural products is very important for today's world for the development and increment of production and for engaging in new productive programs in Nepal.

1.1 Agriculture in Nepal

Nepal is topographically isolated between mountains, hills, and the terai, and from them, 35% of the total area is covered by mountains and 42% is by hills and 23% is covered by mountains (GC, 2018). It is arranged as a trapezoidal shape 870 km in length and 130 km in width. The total area covered by Nepal is 147181 sq. km. In latitude, it ranges from 26o 22' to 30o 27' N and in longitude from 80o 04' to 88o 12' E (Bahadur Thapa & Dhimal, 2017). The three million hector Ares land of Nepal is cultivated agricultural land while the uncultivated land is one million hectares. It of is one the landlocked country with huge opportunities for agricultural production. The

agricultural food products produced in Nepal play an important role in the export sector, contributing to Nepal's national income.

From the old days, agriculture has taken the main source of their income and occupation. In regards to the survey done by National Agriculture Survey 2068, approximately 3,831,000 individuals depend on farming. Although agribusiness is taken as the primary occupation of Nepalese individuals out of 75 districts 33 are still confronting a shortage of food (Bahadur & Magar, 2019). The agribusiness division is significant to extend income, control poverty, and elevate the living standard of Nepalese individuals. However, the execution of this segment has been lacking to meet the increasing demand for food and vocational needs day by day increasing the individual population of the nation (Gauchan & International, 2018).

Nepal Rastra Bank has categorized agricultural products into six categories: food crops, Cash crops, other crops, Livestock, Fish, and Others. And the subcategorization of the products based on their nature. Paddy, Maize, Wheat, Millet, and Barley are categorized as food products whereas Sugarcane, Soybeans, Tobacco, Jute, and Potato are categorized under cash crops. On other crops Pulses, Fruits, Vegetables, and other related items are categorized under other crops. There is a separate category for livestock except fish under livestock milk and milk-related products, Buffalo meat, mutton, pig's meat, poultry meat, and eggs are categorized and Fishery related products are categorized under fish and all other agricultural products are categorized under other products. My research area is food crops.

Nepal is wealthy and invested in agro-diversity in terms of agrarian resources. These assets are beneficial and can be exchanged for the non-agricultural sector if they are contributed to and managed effectively (Sharma Gaudel, 2022). But day by day we are facing a trade deficit and a huge loss in the agricultural sector. Day by day Nepal is importing agricultural food products in Nepal to fulfill daily needs. The top financial specialist was intrigued by the significance of universal exchange in financial and environmental development. Worldwide exchange empowers producers and retailers to seek foreign-produced goods, services, and materials internationally. A country cannot rely on the products they produce domestically but they are also dependent on the product produced by other countries (Okyere, 2020).

Countries are very practicing or willing to reduce imports through many programs such as finding the substitution of imported goods which is also known as the Import Substitution Strategy which helps to promote and sell those products which are produced locally. Numerous developing countries like Nepal have also adopted this strategy to promote locally produced products and discourage and demotivated imports but unfortunately, the plan and policies have not been successful yet and Nepal has faced a huge loss in importing agricultural goods from abroad.

One of the foremost prominent features highlighted in the world economy over the final three decades has been the liberalization of worldwide exchange and payment under the International Monetary Fund (IMF) and the World Bank (WB). The developing and developed nations are currently focusing on the trade liberalization policy to advance their financial and economic development through energetic and static benefits from trade (P. K. Shrestha, 2022). During the period of last two decades, the policy advice from bilateral and multilateral donors to creating nations has been conditioned by expanding the national market to the international market integrating the whole economy into the global economy which refers to Globalization (Matthews et al., 2006).

1.2 Agriculture and Environment

Agricultural land must be used wisely, sometimes intensive agricultural system has caused a few negative externalities on people, creatures, and the environment. Agribusiness is closely connected with the natural environment the inputs required for farming and the trade of agricultural food products influence the environment (K. P. Pant, 2007). Some of the examples which have been directly impacted by the intensive use of the agricultural system are human health, excess pollution of the environment and water, loss of biodiversity, and excess utilization of natural resources (Guesmi, 2013). In Europe, the natural cultivating community still exists despite the wide differences in the preservation of agriculture practices (Peigné et al., 2016). If agricultural land is not utilized properly then there will be a very big problem for every individual and may chance food scarcity in the future, we have no alternative to growing food so this must be utilized in time as there is no planet B to survive.

The natural impact of ecological diseases has been associated with the escalation in the production of food. They may be gathered into the followings disintegration, misfortune of soil richness, reserves of nutrients has been depletion, contamination of soil and water frameworks, for the process of development of urbanization there is a loss of fertile land, loss of crops, loss of wild plant and animals, lose the capacity of natural resources, chemical defilement, excess use of pesticides and development of new diseases (Hamuda & Patkó, 2010). Developing countries are more vulnerable to climate change since the larger part of the population is dependent on agriculture and to grow agriculture there is a need for two main indicators technical and financial capability if those two categories are resolved on time then we can decrease the risk on agricultural production (Karki & Gurung, 2012).

1.3 Import and relationship with Agriculture

Geographically Nepal lies between India and China and has maintained the main trade relationship with these neighboring countries. Import and export are the phenomena of every country to balance the trade and trade-related activities of the country but the country who has able to manage and produce their product in their nation is more independent and also able to gain financial benefits from exporting to other countries and those countries who are not able to meet their demands for locally produced products they always seem have a trade deficit in their balance sheet and to meet the demand of the nation they import from other countries to meet their demands.

Nepal is a landlocked country and very low production in their homeland for survival there is a need to depend on imports and by analyzing the international trade it seems that Nepal is facing huge trade loss each year which directly hurts and impacted the overall production of the agribusiness which directly hit hard to the financial reserve and productivity of the nation. In most countries, foreign trade represents a huge share of gross domestic product(GDP) (Academicians, 2018). Approximately 36% of the total population is currently working in the field of agriculture which is directly or indirectly engaged in this sector. If the products are produced in Nepal and sold in the market Nepali producers are not getting their good value products in the market and difficult to compete in the market with imported same products which discourages or demotivate local farmers in Nepal.

Nepal’s imports are likely to grow more rapidly although there is an increase in the people's income level and the country's development (Press, 2017). The unique structure of the land is sequentially balanced from the Top high Himalayas in the world Mount Everest to low land divided into Himalayan, Hilly, and Terai regions which makes Nepal a potential area for farming different crops (Gyawali & Khanal, 2021). Agriculture in Nepal is still based on the traditional method which is not what will lead to low production. Rice is one of the world's most very widely developed crops that gives food to more than half of the total population (Pudasainee et al., 2018). Despite tremendous government efforts for being independent of rice production in Nepal but still, the import of rice is an increasing trend that has a very negative impact on the local government and the huge local currency has shifted for import.

In present-day times, none of the economies can be self-sufficient in terms of goods and services ordered and requested by the citizens (M. B. Shrestha, 2017). There is a common practice that the goods and services which have produced within the country have been compared with the demand of the nation and if produced goods and service has fulfilled only the demand of the people of the same country which is self-dependent if produced goods and services have excessively produced then the demand of the country then that excessively produced goods and services have been delivered to another country in the name of export to fulfill the demand of the needy country. Nepal imports not as it were petroleum products, mechanical products, and vehicles but moreover, consumable goods and raw materials which can be created inside the nation the volume sent out is exceptionally little.

Nepal is considered an agricultural country but still we import a huge quantity of agricultural food products from India and China. Nowadays, Nepal has not considered good international trade. There is a huge gap between trade imports and trade exports and the indicators of the growth which indicated or lead to the trade deficit. Nepal is featuring a high conglomeration of exporting items as it were 10 export items which are 40% of total exporting items (R. Sharma et al., 2017). So, we came to know that there are only selected items are exported from Nepal due to low production and mostly depend on importing agricultural and other goods from other countries. The agricultural trade has mostly dependent on the Indian market and Nepal has always imported many

agricultural food products from India only a few agricultural food products have been exported to the Indian market which refers to importing is always higher than exporting from India. The trend of importing agricultural products is increasing rapidly rather than exporting agricultural food products in India.

India is a prime trading partner of Nepal. Where Nepal imports a huge quantity of products and services and also Nepal has exported many goods and services to India (Academicians, 2018). Behind the reason for import and export, there is an open border and no need for visas for Nepalese people to stay in India from Nepalese and stay in Nepal for Indians. There are good trade relations between Nepal and India in the past five decades. Also being a neighboring country the trade relationship between Nepal and India has added more mutually beneficial value.

1.4 Research Problem

The topic has not been properly researched previously and in today's world as Nepal is a developing country there is a need for research to maintain the balance of payment for a long-term solution. So, the topic was selected for research that will directly contribute to the policymakers and the concerned stakeholder. Agribusiness is fundamental to human survival and the development of society. With the development of the world population and the development of economic activities, the demand for agricultural food products is also increasing, which directly pressurizes agriculture and the natural resources for mass production to meet the demand (Zhao et al., 2008). Each year Nepal faces huge trade losses on the increasing trends to fulfill those gaps Nepal's government has taken a lot of loans from the World Bank from other countries.

In the context of Nepal, there is no research of Nepal that they the total impact of importing goods and the long-run impact of today's imports, this is a need for today's Nepal. This scenario will degrade the environment and the natural resources so, the world has searched for an alternative method of agricultural production for the development of the agricultural sector and to fulfill the demand of the nations but the scenario of Nepal is a little bit different they are happily enjoyed using old techniques for agricultural production which increases the per capita cost of production and very

unknown about new technology and the impact of modern technology for the financial strata of the country.

The major sources of farming to grow agricultural food products in Nepal are the use of domestic animals, the use of human beings, and the use of machinery. The research says that to plow the land the majority of land has been plowed by the hands of women and one-fourth of the farmers use iron plowers and very few populations have used machinery like tractors to plow the land (GC et al., 2019). Although there are huge natural resources to grow agricultural food products in Nepal but day by day, we are importing huge agricultural food products from different countries in Nepal.

Exporting huge products and importing only a few products increases the economic status of the country but the scenario of Nepal has just the opposite that the importing quantity is always higher than the exporting quantity so, the trade is always a deficit in Nepal. Imported agricultural food products are always a threat to locally produced products in terms of sales and customers' choice. These imported products always demotivated factors for local farmers. They are unable to sell the same product at the same price compared to imported products. In Nepal, local farmers are not able to produce a huge quantity of products so they are unable to compete with imported products because the exporter countries like China and India have mass production which directly indicates the price decrease. The impact of importing local agricultural food products in Nepal has not been analyzed properly. Nowadays only a few daily consumable agricultural food products are produced which is serious attention towards the nation.

1.5 Research Objectives

Based on the above-identified gaps within the scientific literature, the overall objective of this Ph.D. is to contribute to a better understanding of and analyze the impact on locally produced agricultural food products by importing the same product from other countries.

- To analyze the trends of production of agricultural food products in Nepal
- To evaluate the impact of import on agricultural food products in Nepal
- To predict the agricultural food production trend in Nepal.

To achieve these three objectives, three research questions will be answered and addressed to the research problem.

- Does the production of agricultural food products in Nepal the right trend?
- What is the impact of importing agricultural food products on the production of the sector of agricultural food products in Nepal?
- What will be the future production scenarios of agricultural food products in Nepal?

1.6 Expected Research Outcome

After analyzing the research objectives, the objectives must provide some outcomes that will benefit the researcher and relate to the people. The outcome will be presented as follows:

The trend of importing products is not a favorable trend for the trade balance of the government of Nepal, it must be controlled or motivated for production at the local level if, these trends are not well organized then every year Nepal will be facing a huge loss. And if this trend will continue in the future there will be a high chance of food hunger shortly.

The government is facing huge loss from not utilizing local resource, and the import is increasing every year in the increasing trend if, the government of Nepal will not control or investigate this matter they day there will be fully dependent on the import of agricultural food products and there will be the chances of food hunger. And Import of agricultural food products has a positive and direct effect on the production sector of Nepal.

The production of agricultural food products has an important role in foreign trade so, the government of Nepal has to promote and motivate local farmers to produce a huge amount of agricultural food products and takes guarantee to sell those products which will directly impact and improve GDP and per capita income of Nepalese citizens. Besides that, the future production of agricultural food products is not increasing fast compared to the increment of the population growth of Nepal.

1.7 Scope of the study

The research has covered a wide area and scope of the study. The research is mainly dealing with the current import trend with the main agricultural food products in Nepal namely Paddy, Maize, Barley, Wheat, and Millet, and the impact of the trend on the Nepalese economy and the impacts of importing those products on local production in Nepal on the other hand production and productivity of those crops are closely analyzed and draw the conclusion. It provides a clear trend of agricultural food production in Nepal. The research helps to the evaluation of the trade loss of import sectors and forecasting the future status of trade loss and the status of agricultural food productivity in Nepal and analysis of the role of increasing production of agricultural food production in Nepal.

1.8 Significance of the study

The research will be very useful for the policymakers, researchers, and stakeholders who will be contributing to the nation by uplifting the agricultural production of Nepal. The study helps to analyze the current situation of imports in Nepal and formulate policy accordingly for policymakers. It boosts the government bodies to come back from the loss to encourage the productivity of agricultural products in Nepal. Furthermore, it helps to remind the stakeholders regarding the contribution of agricultural products and provide an alternative solution to reduce the trade deficit in Nepal. Forecasting the production of agricultural food products could provide guidelines for framing further policy in Nepal.

CHAPTER II: LITERATURE REVIEW

2.1 Agricultural Food Products and Energy Relationship

For the development of the agricultural sector, there is a need for energy. Based on source, energy is classified into two segments Direct and Indirect energy. Direct energy is the energy that comes from labor, draft animal, and diesel fuel, and the energy that comes from chemical fertilizer, seeds, farmyard manure, farm machinery, and farm tools are considered indirect energy (Pokhrel & Soni, 2019). Further energy inputs are classified into two categories they are renewable energy and non-renewable energy, energies such as labor, draft animal, seeds and farmyard manure belongs to renewable energy, and diesel fuel, chemical fertilizers, farm tools, and farm machinery are belonging to non-renewable energies.

Carbon dioxide emission has expanded over the past few years because of the increasing population, and agricultural production to fix food security in Nepal (Appiah et al., 2018). The advancement of industrial sector energy to horticulture has as of now topped the natural function due to the advancement of industrialization. Analysts have recognized a key interest in the analysis of agricultural input and output of energy utilization in the agricultural division (Chandio et al., 2019). Experimental studies suggest that population growth has been one of the major variables that cause emissions (Appiah et al., 2018).

2.2 Agricultural food production in Nepal

2.2.1 Total GDP of Nepal

The formula for calculating gross domestic product per capita is: GDP divided by midyear population. GDP is calculated as the total gross value added by all domestic producers, plus any applicable product taxes, and minus any subsidies that are not reflected in the prices of the final goods. It is calculated without taking into account natural resource depletion and deterioration, or depletion and degradation of natural resources.

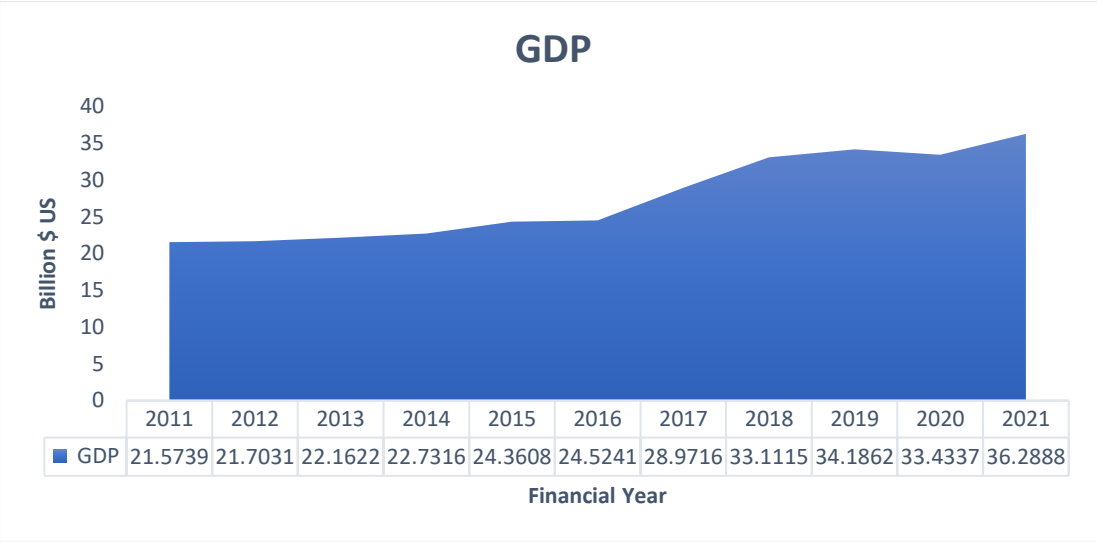


Figure 2.1 Total GDP of Nepal

Source – Nepal Rastra Bank

The Gross Domestic Product of Nepal is seeming to be increasing each year. Which is a good signal for the economic development of the nation. The total gross domestic product has indicated the total GDP per capita income. Those countries which have a good GDP seem to be for the nation. The export has determined by the total production because on total production goods, the total demand of the nation is kept for the country's consumption and the rest of the produced goods are to be sold in the international market for revenue. So, we can say that more production in the country leads to an increase in export which helps to increase foreign currency reserves in the nation.

In 2011 the total GDP is 21.57 US Billion $ and after ten years which is 2021, the GDP increased by 68.19% and reached 36.28 US Billion $ but at the same time compared to the population increment the population has increased by 9.70% which seems to increment of GDP is higher than the increment of the total population. By analyzing the GDP after 10 years in 2031 based on the last 10 years of growth the GDP will be 61.01 US Billion $ which helps to increase productivity and increase the lifestyle of the people of the nation.

2.2.2 Total GNP of Nepal

GNI (once GNP) is the whole of value included by resident producers and additionally product taxes (fewer subsidies) not included within the valuation of yield plus net receipts of essential wage (remuneration of workers and property income) from abroad.

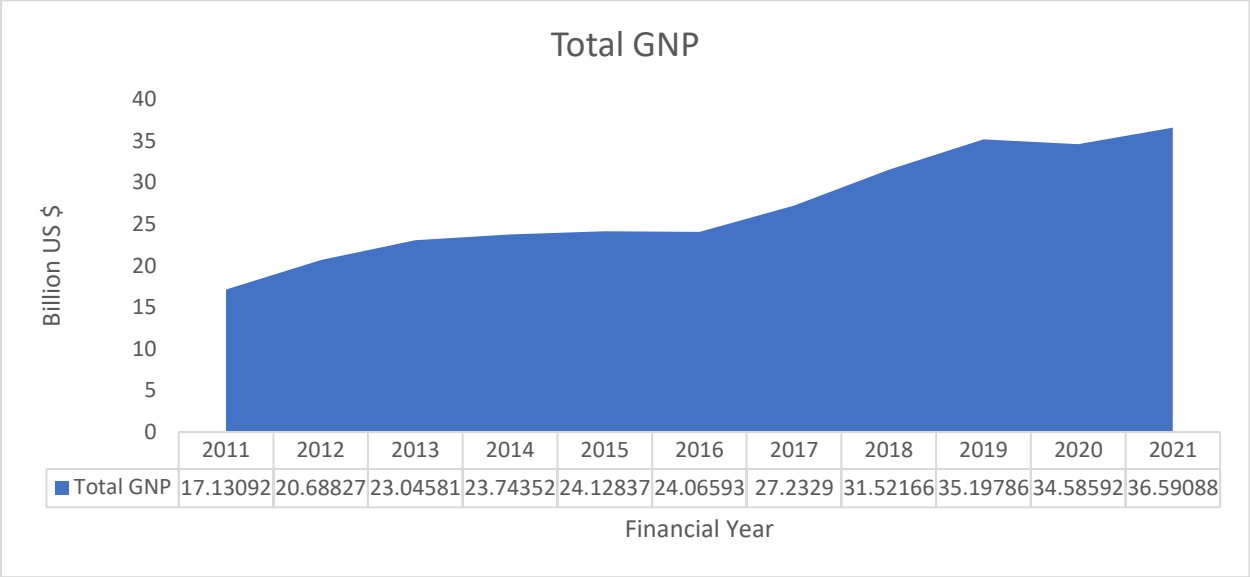


Figure 2.2 Total GNP of Nepal

Source – Nepal Rastra Bank

The gross national product of Nepal is also appearing to be rising annually. Which is encouraging for the country's economic growth. In Nepal, the GNP has grown faster than the GDP. Countries with robust economies are those countries that have high GDPs and GNP. The Gross National Product of Nepal has brought in greater money for the government. We can therefore conclude the increased output in a nation results, in higher exports, which contribute to a rise in the country's foreign exchange reserves.

In 2011, the total GNP was 17.30 US billion. Ten years later, in 2021 the total GNP climbed by 113.60% to reach 36.59 US billion. However, in contrast to the population rise, which was 9.70%, it appears that the increase in the total GNP was greater than the population increase. By looking at the GNP after 10 years, in 2031 based on the growth of the previous 10 years, the GNP will be 78.15 US billion dollars, which contributes to rising productivity and improving the standard of living for the population of the nation.

2.3 Import and Export practice in Nepal

Nepal's pursuit of trade agreement negotiations is primarily driven by the desire to improve the condition of exports, diversify its exports in terms of products and destinations and reduce its trade deficit (R. Adhikari & Kharel, 2011). Nepal's foreign trade, on the other hand, remains concentered on India, with whom it has had a bilateral preferential trade agreement since 1950. Trade dependence on India has increased over time, as has the merchandise trade deficit, which is largely funded by remittance. Nepal's major export destinations after India are the European Union the United States, Bangladesh, and China. After India, Nepal's major import sources are China, the European Union, Saudi Arabia, and East Asian Countries. Each year Nepal is facing a trade deficit which is the saddest news for Nepalese citizens. The nation's trade deficit is frequently identified as one of its most significant structural challenges (R. C. Paudel & Burke, 2015).

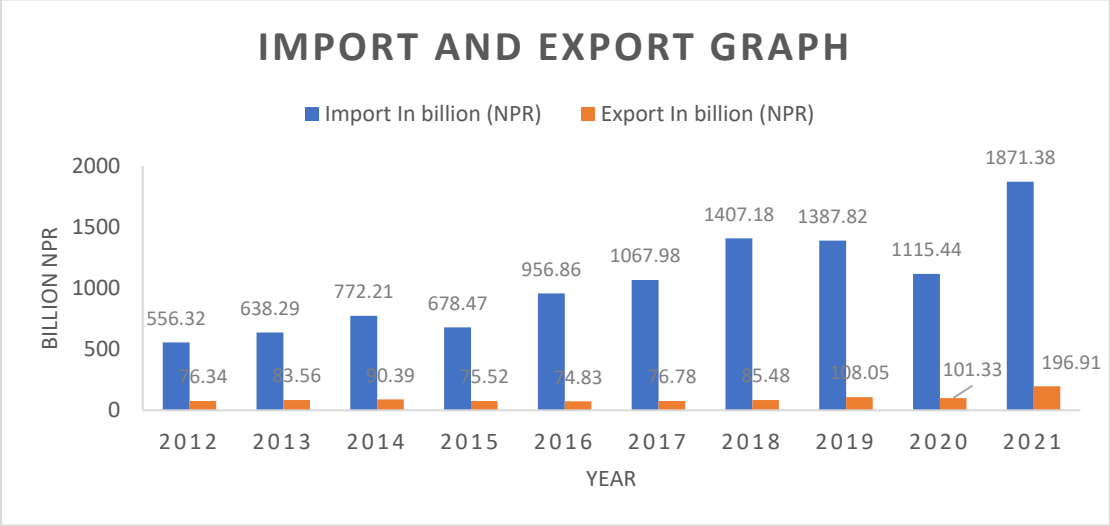


Figure 2.3 Total Import and Export Graph

Source – Nepal Rastra Bank

The country's trade status has been shown by analyzing the status of its total imports and export. If the total export is greater than its total imports the country is in a trade surplus and if the import exceeds exports, then the country has a trade deficit but if the volume of imports and export is the same then the trade is in breakeven neither loss nor profit. But the context of Nepal is not good for international trade. Each year Nepal is facing a trade deficit which has a big negative impact on the economy, foreign currency

reserve, local cultivated land, and productivity of Nepal. The government of China and Nepal reached a deal in 2012 to sell Nepali citrus to that country.

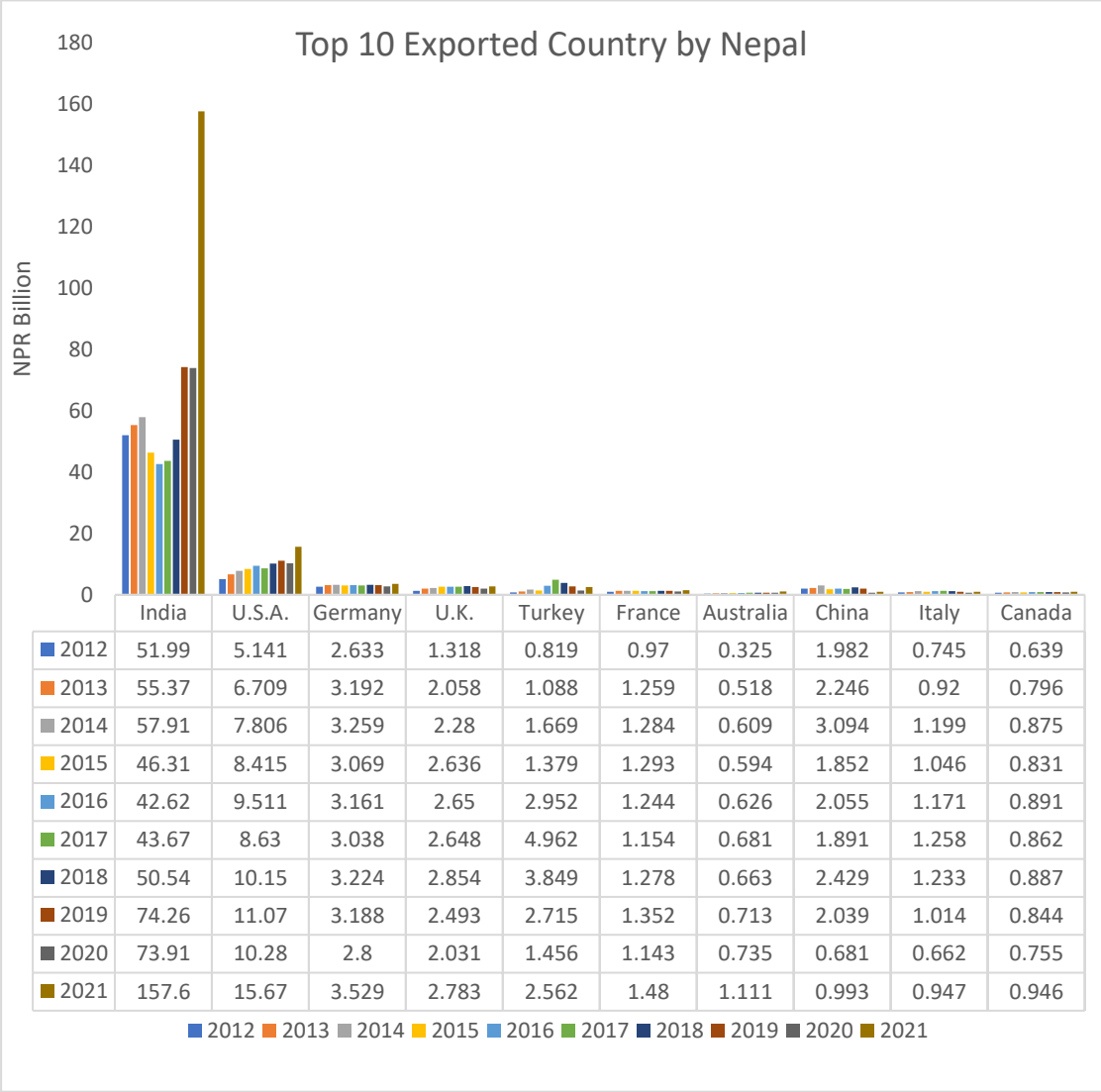
The necessary authorities prepared Syangjya mandarin and Sindhuli district sweet orange for export (D. Adhikari & Dhoj, 2020). The government and government personnel have to take serious action to control the increasing trend of Imports in Nepal to get a trade surplus and to earn money from exporting Nepalese products to the international market. The total import increased each year in an increasing trend, whereas exports have not increased compared to imports. It seems that in 2021 we imported 10 times more than our export.

By analyzing the trend of Import and Exports of Nepal, we found that in 2012 the import was 556.32 billion NPR, and exactly after ten years i.e., in 2021 the import increased by 1315.06 billion NPR and reached 1871.38 billion NPR which is 2.36 times increment in total value. For export, the export was 76.34 billion NPR in 2011which is only 13.72% of the total imported value there is a huge trade loss during that period. And moving to 2021 exactly after ten years the export has increased by 120.57 billion US and reached 196.91 billion USD which is an increment of 1.57 times. Overall, we found that the increment of imports is higher than the increment of export to maintain the trade balance we have to focus on production in Nepal to export more things from Nepal to maintain the trade balance.

2.3.1 Top 10 countries exported from Nepal

Since joining the World Trade Organization (WTO) in April 2004, Nepal has been conducting international trade by WTO rules (Taneja et al., 2016). The neighboring country of Nepal that is India is considered the most trading country for Nepal. Most of the trade-related activities had been done for mutual benefit with India. Many factors have been related to a great deal with India. The relatively same culture and known language with countries and having an open border with India added value to doing good international trade in Nepal. We have the export huge locally produced products in India. The open border with no restrictions for doing business plays a great role in doing business with India.

To India, we have exported 51.99 billion NPR in 2012 and after ten years that is 2021 from Nepal, we have increased the export and reached 157.6 billion NPR. After India USA is the second largest exporter country for Nepal. Nepal has exported a lot of herbal medicines to the USA which helps to contribute a good amount of revenue for the economic development of Nepal. Nepal exported 5.141 billion NPR to the USA in 2011 and after ten years in 2021, the export has increased by almost 3 times and reached 15.67 billion NPR which is a good achievement for Nepal. After the USA the export to Germany, China, the UK, Turkey, France, Italy, Canada, and, Australia is the most exported country from Nepal respectively.



	India	U.S.A.	Germany	U.K.	Turkey	France	Australia	China	Italy	Canada
2012	51.99	5.141	2.633	1.318	0.819	0.97	0.325	1.982	0.745	0.639
2013	55.37	6.709	3.192	2.058	1.088	1.259	0.518	2.246	0.92	0.796
2014	57.91	7.806	3.259	2.28	1.669	1.284	0.609	3.094	1.199	0.875
2015	46.31	8.415	3.069	2.636	1.379	1.293	0.594	1.852	1.046	0.831
2016	42.62	9.511	3.161	2.65	2.952	1.244	0.626	2.055	1.171	0.891
2017	43.67	8.63	3.038	2.648	4.962	1.154	0.681	1.891	1.258	0.862
2018	50.54	10.15	3.224	2.854	3.849	1.278	0.663	2.429	1.233	0.887
2019	74.26	11.07	3.188	2.493	2.715	1.352	0.713	2.039	1.014	0.844
2020	73.91	10.28	2.8	2.031	1.456	1.143	0.735	0.681	0.662	0.755
2021	157.6	15.67	3.529	2.783	2.562	1.48	1.111	0.993	0.947	0.946

Figure 2.4 Top 10 Exporter countries from Nepal

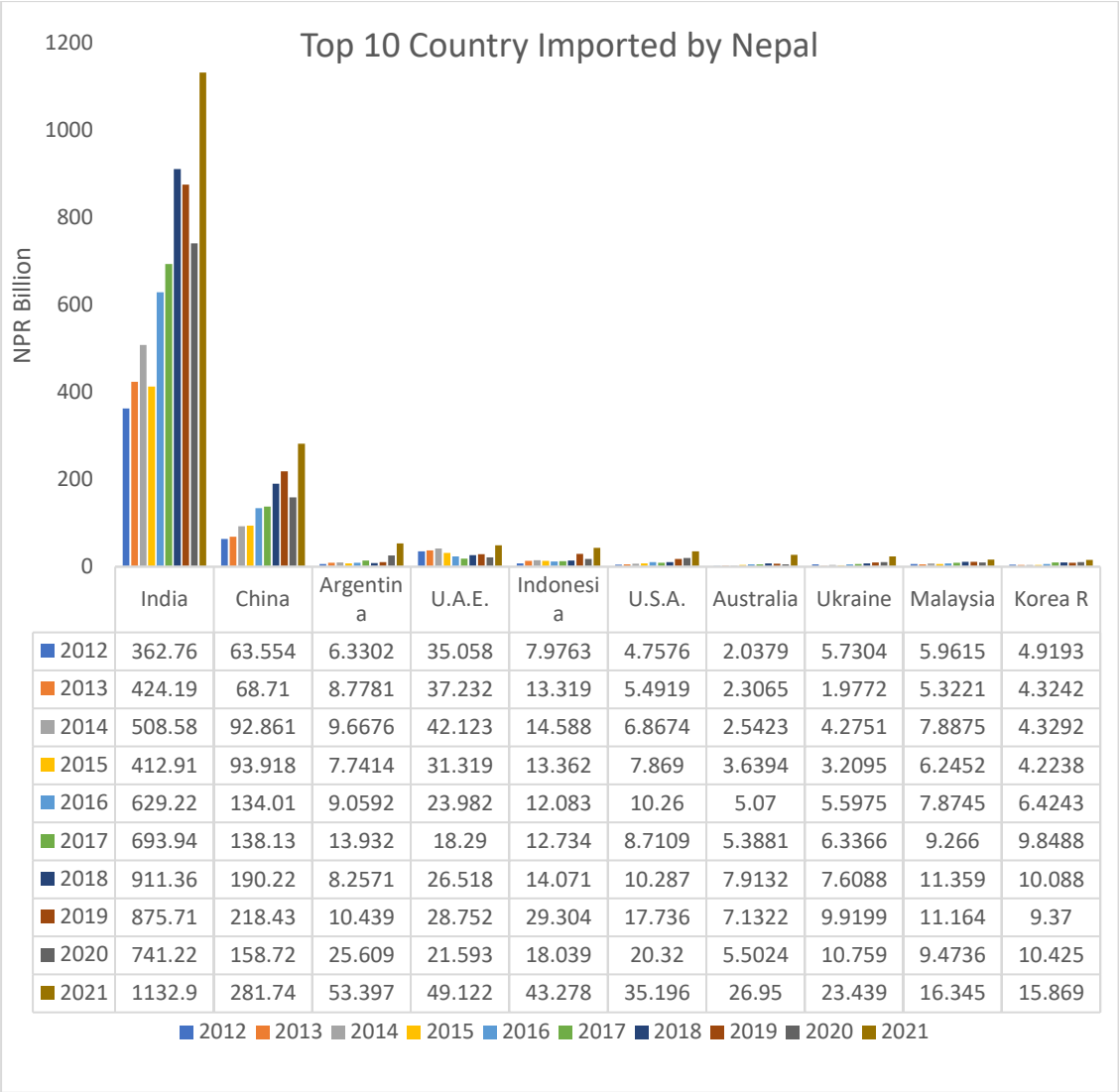
Source – Nepal Rastra Bank

2.3.2 Top 10 importing countries by Nepal

Economic expansion in Nepal as a result of increased remittance is simply "pseudo-growth." The nation's economic ability to support imports from outside isn't due to a top scale of exports of both goods and services, but rather to the returns to the returns of labor that was expanded in those exports (Thagunna & Acharya, 2013). Past few decades Nepal was a good exporter of agricultural food products but the scenario has changed and now Nepal is a good exporter of cheap labor and manpower and expects good remittance from that system. Which is the main cause of decreasing agricultural food production in Nepal.

India is the biggest trader country for Nepal. Most of the products and services which have been imported are from Nepal. Nepal buys different types of goods and services from India each year. The majority of products have been imported from India for consumption. In 2012 Nepal has imported the value of goods and services worth NPR 362.76 billion but at the same time, Nepal exported to India worth NPR 51.99 billion. But in 2021 the import volume from India has increased and reached NPR 1132.90 billion it seems that each year the quantity of imports from India has increased increasing trends.

After India, China is the second largest importer country for Nepal and in the financial year, 2021 Nepal imported the worth of NPR. 281.72 billion and due to the neighboring country with India and China the trade relationship is very good with both the neighboring countries. After India and China, the most imported nations for Nepal are UAE, Indonesia, Argentina, USA, Australia, Ukraine, Malaysia, and South Korea. For the development of the economic and financial strata of the nation, the country has to fully utilize the available resources and produce goods and services to be reached international market which will help gain foreign currency.



	India	China	Argentina	U.A.E.	Indonesia	U.S.A.	Australia	Ukraine	Malaysia	Korea R
2012	362.76	63.554	6.3302	35.058	7.9763	4.7576	2.0379	5.7304	5.9615	4.9193
2013	424.19	68.71	8.7781	37.232	13.319	5.4919	2.3065	1.9772	5.3221	4.3242
2014	508.58	92.861	9.6676	42.123	14.588	6.8674	2.5423	4.2751	7.8875	4.3292
2015	412.91	93.918	7.7414	31.319	13.362	7.869	3.6394	3.2095	6.2452	4.2238
2016	629.22	134.01	9.0592	23.982	12.083	10.26	5.07	5.5975	7.8745	6.4243
2017	693.94	138.13	13.932	18.29	12.734	8.7109	5.3881	6.3366	9.266	9.8488
2018	911.36	190.22	8.2571	26.518	14.071	10.287	7.9132	7.6088	11.359	10.088
2019	875.71	218.43	10.439	28.752	29.304	17.736	7.1322	9.9199	11.164	9.37
2020	741.22	158.72	25.609	21.593	18.039	20.32	5.5024	10.759	9.4736	10.425
2021	1132.9	281.74	53.397	49.122	43.278	35.196	26.95	23.439	16.345	15.869

Figure 2.5 Top 10 importer countries by Nepal

Source – Nepal Rastra Bank

2.4 Major Causes of Increasing Imports in Nepal

It is necessary to import products and services to satisfy the demands of those nations that cannot satisfy their requirements and desires by developing all the necessary goods and services in their own country. To promote exports, maintain currency exchange stabilization, external sector security, and targeted foreign currency reserves, the 15th plan for Nepal aims to lower the budget deficit by expanding output, controlling the imports, and diversifying the market on the nation and goods-by-basis (R. K. Shrestha, 2021). Though imports have increased quickly relative to export in the case of Nepal,

the reverse has occurred. Tariffs are levied by the nation importing the commodities on those goods.

The primary goal of import taxes is to reduce the competitiveness of imported items and to support the domestic production of goods and services. Nepal, which is still considered to be a least developed nation is entitled to duty-free or subsidized entry on a variety of export goods in the market like the US, India, China, and the EU but Nepal has not been able to make use of this privilege (Sainju, 2021). Besides that, there are many reasons for increasing the trend of import, some reason which are neglected and which is the main causes of increasing import are as follows:

2.4.1 High direct and indirect production Costs

Nepal is a developing nation with outdated technology. Because of the absence of advanced technology, commodities are expensively manufactured using expensive imported components. Similarly, due to the shortage of highly skilled workers, Nepalese products are expensive and of poor quality, making them unable to compete with the world markets (S. Sharma, 2020). The inflation rate in Nepal has increased day by day which has directly impacted the production cost. And if production cost is high then automatically the cost of the product is high and unable to compete with low-cost products.

2.4.2 Open Indian Boarder

The free flow of commerce caused by Nepal's open boundary with India is another major issue for Nepalese goods. Indian open markets help Indian products to sell in Nepal without any barriers. It happens because Indian, as well as Chinese products, are inexpensive in the Nepalese market, while Nepalese goods are pretty expensive. Similarly, due to illegal trade practices, illegal traders benefit from both export and imports because of open borders. So, the open border with Nepal and easy business transactions, and similar language between the two countries help to contribute to and increase imports in Nepal.

2.4.3 Landlocked

Naturally, Nepal is a landlocked hilly, and a nation with a rough structure, which represents one of the main barriers to Nepal's international trade development. Due to

its geographic location, it must export and import goods through India and China, which boosts the price of business dealing by increasing not simply the cost of travel but also the cost of moving goods from one method of delivery to another. The landlocked nation faces huge problems in different sectors. They are unable to produce and sell more products the foreign country. Being a landlocked country Nepal has faced huge opportunity loss. A country that has a sea can take different opportunities from having a sea.

2.4.4 Increase in population and decrease in Agricultural productivity

While Nepal's population is rising quickly, the number of food crops produced is not keeping pace. Less industrialization and technology are to blame for agriculture's low production. Agricultural farming is practiced by a huge number of populations in Nepal (Simkhada, 2019). In Nepal population is increasing each year and the increased population has increased consumption so if the production of agricultural food products will not increase at the pace of the increasing population, then, the consumption is increased which will result in low export by the nation because the majority of the produced product has consumed in Nepal. So, the government has to take action for increasing production for the increment in export from Nepal.

2.4.5 Redirection of rural advances to the non-productive segment

Federal grants and large financial institution loans for agriculture are heavily invested in unproductive industries like real estate, housing, and other business. People borrow money for soft purposes and agricultural purposes but it has not been invested in agriculture and the same loan has been invested in unproductive sectors which will have an impact on the economy of the country. In Nepal, the government has provided agricultural loan at a discounted rate by providing huge subsidy for the development of agricultural production but after providing loan to the consumer there is no people or strict rule for controlling and regulating those loans because those loans are utilized for non-productive purposes such as purchasing house, land, motor vehicle and other luxury products which impacted on decreasing agricultural production sector and reducing the productivity of agricultural export in Nepal.

2.4.6 Inadequate warehousing and processing facilities

The absence of physical institutions like cold storage facilities, processing plants, and warehouses is also boosting Nepal's agriculture imports. Because there is a shortage of infrastructure, including roads and energy, storage, and markets the generated and produced goods have not reached the market. Therefore, people in one area import food to be consumed while those in another area wasted it.

According to recent Turkish research, the Turkish economy may suffer unfavorable effects from a policy that stabilizes the overall price level by increasing imports rather than (or in addition to) regulating economic growth. Therefore, policymakers should identify strategies to reduce the volume of overall imports. Import and importing products go hand in hand. Therefore, controlling imports is necessary for both the economy and imports (Andrianary & Antoine, 2019). It has been found that now the supply of money, the trade imbalance, and local currency depreciation are all positively correlated. On the other hand, the increased rate of interest and growing domestic income deteriorated the trade deficit in Nigeria.

The need for an appreciation of the domestic currency and an increase in imports from outside arises from the fact that the former increases the demand for foreign products and services and the latter promotes capital inflow (Silwal et al., 2008). Since businesspeople want maximum profits by importing more commodities when there is governmental uncertainty and the government is defending its continuation, political unrest, according to Koirala 2005, is likely to rise the trade deficit. Business personnel wants to achieve more and more profit and they are focusing the profit by importing rather than producing in their own country.

So, there is always a conflict between the government and the businesspeople. Government always wants to produce more in their own country rather than importing, to balance both parties there is a need for logical policies. Nepal's research team has not researched this area. There is a need for the team to research and find the main reasons for increasing imports so that that problem will be resolved on time. If the main problems and the main reasons are timely discovered and resolved those issues on time then Nepal will gain a lot of income from exporting goods and contributing to the national income.

2.5 Government initiations for import control

The part of international trade on financial development has been a basic concern and discussion among economists for decades. It shows that there is a positive relationship between economic growth and international trade. There is always critical discussion among researchers, academicians, and policymakers about the impact of imports and export on economic growth (Panta et al., 2022). Most of the theory shows that there is a relationship between international trade and economic growth. International trade helps to increase the nation's economic development directly and indirectly. Theoretical studies support the positive effects of exports on national economies, but because agricultural exports are unique and subsidization practice are peculiar, there are not any empirical studies to support these claims (Remeikiene et al., 2018). Directly it contributes monetary value to the national economy besides that it indirectly impacted many factors from international trade. Some factors which are impacted by international trade are as follows:

2.5.1 Utilization of resources

Nepal is an agricultural country more than 50% of the total population is engaged in agriculture as their main source of income. But still, Nepal is facing a huge loss in agricultural business each year which has a very big impact on the overall national economy due to the low production and low international trade. Locally resources like cultivated land, manpower, organic fertilizer, and locally available raw material are not been properly utilized. So, to utilize these unused resources there is a need for international trade and a proper way and mechanism for improving productivity and properly utilizing available resources.

2.5.2 Increment in domestic and international tourist

The tourism sector has a great role in the development of the nation. If there is a free flow of trade between two countries then there is a huge movement of tourists. The research shows that in most of the developed countries, the success factor for the increment of their finances has tourism and the industry. Tourism and the industry are interrelated each other. A country that has good international trade has good tourism and also it helps a good contribution to the development of the economy. Currently, Nepal's economy is mostly driven by the service industry. With a contribution to GDP

of approximately 49.8%, the overall service industry has overtaken all other sectors as the highest within the economy. This rapid expansion is mostly attributable to the telecommunications, tourism, and financial service industries (B. Pant, 2005). To promote foreign trade, Nepal is making sufficient efforts.

2.5.3 Creation of job opportunities

Nepal is a landlocked country, more than 50% of the total population engaged in agriculture for the survival of their family which is considered the main source of income. But due to low agricultural productivity, farmers cannot generate a sufficient amount of income from agriculture to survive. An increase in the export of local agricultural products helps to create lots of job opportunities in Nepal. The unemployed rate in Nepal is so high. After graduation from college and university, there is no big job market for those people and they go abroad for further jobs. So, all these unemployed problems will be solved if there is a good production of agricultural products in Nepal.

2.5.4 Increment in revenue

International trade has increased the movement of the local and national levels in both importing and exporting nations. Exporting nation increases their revenue and foreign currency by selling goods and services to the importing countries. On the other hand, the importing country has to give or send money on the behalf of purchasing goods. Increments in revenues are the basic indicators of the development of the nation. The more increment in government revenue the more powerful the country is so international trade and exporting products to the international market make the country more powerful.

2.5.5 Increase in local production

In the current situation of Nepal, most of the farmers who are growing agricultural food production in Nepal are just growing for their consumption and if the produced production is more than their consumption, they sell it to their local market for their survival and livelihood, they are not engaged for production for international market so and unable to think that their locally produced product will be sold on the international market. Globalization makes this possible for the free flow of selling their production of goods and services to sell in the international market and earn money. International

trade helps to increase the locally produce products because of the free flow of sales in the national and international markets. When each country focuses on producing the particular goods in which it holds a cost advantage and trades some of these goods for the goods in which it holds a negative and significant impact, each country may wind up utilizing more goods overall than it would have otherwise. Following economic progress, a nation gains a competitive advantage in the goods that are manufactured using a large proportion of its relatively low-cost and plentiful industrial inputs (Bahadur & Magar, 2021).

2.5.6 Increase the lifestyle of people

Due to the higher income earned by the people, they are enjoying their good lifestyle as they have previously lived before globalization and international trade. In less developed nations, economic expansion is most likely the most significant policy goal, and exporting is frequently viewed as a source of growth. The export-led development model holds that export success is a key factor in determining economic expansion and has a range of theoretical underpinnings (Dawson, 2005). So, international trade has increased the nation's lifestyle and overall economic development. The exporting country gradually increases the government revenue from exporting goods and services and the importing countries face overall trade loss.

2.5.7 Reduce trade fluctuations

International trade also helps to decrease the fluctuations of trade deficit the increment in export helps to more increment in national income. The total import of such primary goods- primarily foodstuffs and livestock products- in which emerging nations as a whole are lacking will keep rising quickly. In contrast, it is anticipated that the net trade balance for conventional farming exports (such as tropical drinks, bananas, sugar, vegetable oils, and oil seeds) will increase more slowly or even fail. According to the projection by 2030, developing nations' agricultural trade imbalance will be significantly larger, totaling US$31 billion worth of net imports (Pingali, 2007). So, export helps decrease trade fluctuations in exporting countries and increase the foreign exchange reserve.

2.5.8 Improvement in technology

Globalization helps to transfer technology from one country to another country and helps to implement new technology from developed countries to developing and underdeveloped countries. International trade is also a medium of shifting new technology worldwide. The rapid expansion of both the internet and core technologies, which have significantly decreased interchange and discovery costs in several countries participating in the institutions for Economic growth and development, maybe a strong indicator of the possible advantage of underdeveloped nations (Pingali, 2007). Technology has more power to change the world. Globalization and international trade have played a vital role in the overall development of the nation. Development of agricultural investigation and improvement programs and exercises in Nepal

Table 2.1 Government Initiations for agricultural development program

S.N.	Year	Program
1.	1921	Foundation of agricultural office at Charkhal, as a regulated activity for agricultural advancement.
2.	1925	Shifted agricultural office from Charkhal to Singha durbar as an Agri-Demo Farm after changing agricultural office to Department of Agriculture
3.	1940	Delivered a few vegetable seeds at Sadar exploratory cultivate, Tahachal, and sold them from Bij Bhandar located at Juddha Sadak.
4.	1947	Establishment of a Central Experimental and Research Farm at Parwanipur and an Agri farm at Kakani. And start of cultivation advancement from government division with the foundation of natural product nursery cum trial plantation at Chhawani, Godavari, and Balaju.
5.	1951	Agricultural farms were built up at Godavari and Kakani and imported and planted subtropical natural products in Kakani which was supported by the USA.

6.	1952	For the development of a new vegetable variety in Nepal, Japanese mountaineering brought a white-neck variety of radishes.
7.	1955	Restructuring and expansion of the Department of Agriculture five sections are developed are Agronomy, Horticulture, Livestock and Dairy, Agri engineering, and Fish.
8.	1957	Managed understanding with Indian support mission for horticulture segment development.
9.	1959	Foundation of Agri-farm at Janakpur, Nepalgunj, Doti with isolated cultivated unit
10.	1960	Start of cultivation advancement program (2017-2030) which was supported by the Indian Government
11.	1961	Foundation of horticulture Centre at Kirtipur
12.	1962	Introduction of Horticulture Centre at Daman, Trishuli and Baitadi
13.	1963	Inauguration of Horticulture Centre at Pokhara
14.	1964	Establishment of Khumla Agri-farm
15.	1966	Broken down Department of Agriculture and divided into five departments as Agriculture expansion, Fisheries, Horticulture, Livestock, and Agriculture education and research.
16.	1972	Merged five departments into a single Department of Agriculture and developed two national sections Fruits and vegetable department and simultaneously two developed two national programs they are citrus and potato development.
17.	1975	This year was announced as an agricultural year and at the same time, the Citrus development has shifted to Dhankuta.
18.	1977	This year three years of BSC in the agricultural program have started at Agriculture and Animal Science Rampur. Another project was the

		Tuki system in Dolakha and Sindhupalanchowk which was supported by the Swiss
19.	1978	This year the Coffee promotion in districts Gulmi, Palpa, and Arghakhanchi was initiated.
20.	1981	This year the sweet orange program has established at Sindhuli
21.	1983	Started prioritized Citrus Advancement program
22.	1984	Started generation of Tissue refined potato seed
23.	1985	Announced Sindhuli and Ramechhap areas as a sweet orange Started 1st stage of Horticulture Development project by JICA Foundation of Kalimati fruit and Vegetable Wholesale market
24.	1987	In 11 areas The Hill Fruit Development project has started which was supported by ADB
25.	1990	Division of Department of Agriculture has made individual Horticulture development in 33 centers Development of Cultivation development area in 26 more districts Started 20 years master plan for the development of horticulture
26.	1992	Blended 5 distinctive offices under one office as the Ministry of Agriculture into a single office for the development of Agribusiness and appoint 7 program directors. Promoted vegetable and fruit product improvement segments into Divisions, the foundation of the national tea and coffee board, and the foundation of floriculture affiliation Nepal at the private segment. Privatization of six cultivation centers which are Janakpur, Helambu, Chitlang, Humla, Panchkhal, and Dhading but due to the

		disappointment of accomplishing the targets again they are appointed under the government in 1994
27.	1997	Ended the program which was supported by JICA
28.	2000	Development of Karnali zone agriculture development project in 5 districts The National Tea policy is approved
29.	2003	The National Coffee policy is approved
30.	2007	Started Lime and Onion Mission Program Started public-private partnership program: one town one item
31.	2009	Started the project for farming commercialization and trade in 25 districts by adopting a value chain approach for six years
32.	2010	Development of high-value agricultural project by the adaptation of a value chain approach for 10 years
33.	2012	Started public-private partnership program: One item must be produced in one district
34.	2013	Executed a youth-centered program for vegetable improvement
35.	2015	The formulation of the agricultural development strategy will be ended in 2035.
36.	2016	Started the Prime minister's Agri-business modernization program for 10 years to green crops such as potatoes, vegetables, citrus, etc.
37.	2017	Celebration of the fruit decade ended on 2027
38.	2018	Declared as fruit distribution year 2018.

2.6 Relationship of Agricultural food production with GDP (Gross Domestic Products) in Nepal

It was predicted that 690 million individuals, or nearly 8.9% of the total world's population, are undernourished, based on the FAO 2019 study. Over the next 5 decades, it is projected that the world's food requirement will double as the natural resources needed to support agriculture because more limited, stressed, and vulnerable to climate change. In various emerging nations, agriculture is responsible for at least 40% of the gross domestic product and 80% of jobs. At the same time, more than 70% of people on the planet reside in rural areas, where they must depend on agricultural production (A. Ghimire et al., 2021).

Even though the agricultural industry contributes significantly to the country's GDP, its growth rate seems too unstable. Because agriculture is growing at a slower rate than the increase in population. Agricultural production produces far too little in my opinion. According to CBS 2011 census data, 60% of landowners are incapable to grow sufficient food production to support their way of life (Chaudhary, 2018). According to some research, future climate change-related losses in hand productivity may reduce the quantity of food that South Asian nations can produce from their crops and increase the cost of food on the domestic market. Hunger in the area may increase as a result of this decreased local consumption of food. The economy as a whole is affected negatively by climate change's consequences on food productivity (Bandara & Cai, 2014).

Sita Khatiwada, a lecturer at Mahendra Multiple Campus in Dharan, conducted a recent study in which she discovered that there was not any clear relationship between GDP growth rate and trade, GDP growth and population growth rate, GDP growth, and domestic credit to the private sector and GDP growth and consumer price index (Khatiwada, 2020). To determine the contribution of agriculture to Nigeria's gross domestic product, a Nigerian researcher conducted research based on trend analysis in 2014. The researcher came to the following conclusion. The regression result demonstrated that agricultural production has a beneficial relationship with the gross domestic product and makes a major contribution with a coefficient of 0.664, suggesting that even a percentage growth in agricultural contribution can keep

increasing the Gross Domestic by 66.4% points higher compared to any other segments (G.T et al., 2014).

We have analyzed the data of forty to find the relation between agricultural food production and Gross Domestic product in Nepal. We found that within four decades, Nepal has exported just 3.78% of its total GDP. As a result, we still increase production by 85.97% of the current level to meet the country's imports and exports need to maintain a country's good international trade balance. In contrast, Nepal imported 26.93% of its total Gross Domestic product during the period, while we only exported 14.03% of the total imported value. Nepal needs to increase food production which is possible to motivate and educate the benefits of the modern agricultural system in Nepal. Still, the majority of Nepalese who depend on agriculture as their main source of income produces agricultural food products on traditional and which will lead to low production and unable to fulfill the whole demand of the Nation, besides that due to low production of agricultural production they are unable to gain good income from the production. In this context, the Nepal government has to educate them on the modern agricultural style and also guarantee to sell agricultural products for their safety.

CHAPTER III: METHODS AND MATERIALS

The goal of this research is to determine the relationship between importing agricultural food items and the economic growth for sustainable and successful international trade of agricultural food products in Nepal. Secondary data were acquired from the authorized organization, Nepal Rastra Bank, also known and World Bank Nepal which is very trustworthy organizations. The detail of the data variable and data sources is mentioned below the table.

3.1 Data

Table 3.1 Variable, Unit of Measurement, and its Sources

Variable	Unit of Measurement	Source
Cereal Food Production	Thousand Metric Tons	(Nepal Rastra Bank 2022)
Productivity	Thousand Metric tons per hectares	(World Bank Nepal 2022)
Mean temperature	Celsius degree centigrade	(World Bank Nepal 2022)
Cultivated area	Thousand hectares	(Nepal Rastra Bank 2022)
Fertilizer used	Metric Ton	(Nepal Rastra Bank 2022)
Import	Million Rupees	(Nepal Rastra Bank 2022)
Export	Million Rupees	(Nepal Rastra Bank 2022)
Trade Balance	Million Rupees	(Nepal Rastra Bank 2022)
Government Outstanding	Million Rupees	(Nepal Rastra Bank 2022)
Foreign Currency Reserve	Million US Dollars	(Nepal Rastra Bank 2022)
Electricity Generation	Terajoule	(World Bank Nepal 2022)
Foreign Exchange Rate	LCU per US$	(Nepal Rastra Bank 2022)
Import of Agricultural food Products	Million Rupees	(Nepal Rastra Bank 2022)

3.1.1 Production

The five types of agricultural food production that have been used for data analysis are Paddy, Maize, Wheat, Barley, and millet. All production has been calculated on thousand metric tons. The 40 years of data have been used starting from the financial year 1981/82 to get the results.

3.1.2 Cultivated Area

The cultivated area is Nepal and has been recorded on the thousand-hectare scale. The 40 years of data have been used starting from the financial year 1981/82 to get the results.

3.1.3 Productivity

Productivity is the ratio of production which is calculated based on the production and cultivated area, and productivity is the output by dividing the cultivated area by productivity measured in metric tons per hectare. The 40 years of data have been used starting from the financial year 1981/82 to get the results.

3.1.4 Import

Import is the monetary value which is calculated in million rupees. On the other hand, import is calculated on the fiscal year in which Nepal has purchased any product from outside the country. The 40 years of data have been used starting from the financial year 1981/82 to get the results.

3.1.5 Export

Export is the monetary value which is calculated in million rupees. On the other hand, Export is calculated for each fiscal year that Nepal has sold in the international market. The 40 years of data have been used starting from the financial year 1981/82 to get the results.

3.1.6 Trade Balance

Trade Balance is the monetary value in million Rupees that the country has been overall gaining or losing. If a country has excessively sold the products than buying from other countries then the country is in a positive trade balance and if a country has purchased more products, than sales in the international market then the country is in a trade deficit. So, the trade balance is calculated by subtracting export from imports. The 40 years of data have been used starting from the financial year 1981/82 to get the results.

3.1.7 Fertilizer Used

In this research fertilizer refers to chemical fertilizer and under chemical fertilizer Nitrogen, Phosphorus and, Potash is used. The data is kept according to the ascending

order of the financial year. The measurement of data is in metric tons. The 40 years of data have been used starting from the financial year 1981/82 to get the results.

3.1.8 Government Outstanding

Government outstanding refers to the total government paying the debt to the parties. The total debt is the total sum of internal and external debt. Internal debt is the outstanding amount inside the nation that is domestic debt. External debt refers to the outstanding debt amount to be paid to the international sector. The debt is calculated in the million rupees. The 40 years of data have been used starting from the financial year 1981/82 to get the results.

3.1.9 Foreign currency reserve

The foreign currency reserve is the total of gold, IMF reserve tranche position, SDRs (Special Drawing Rights), and foreign exchange which is calculated on the equivalent of Million US Dollars. The 40 years of data have been used starting from the financial year 1981/82 to get the results.

3.1.10 Electricity Generation

Electricity generation refers to the total electricity produced from hydropower sources in Nepal. The 30 years of data have been used starting from the financial year 1990-2019 to get the results. The data is generated form the official website of Nepal Rastra Bank

3.1.11 Annual Mean Temperature

Annual mean temperature refers to the temperature which is calculated based on the yearly mean in Nepal. The 30 years of data have been used starting from the financial year 1990-2019 to get the results. The data is generated form the official website of Nepal Rastra Bank

3.1.12 Foreign Exchange Rate

Foreign exchange rate refers to the local currency equivalence with the base of the US dollar. The 30 years of data have been used starting from the financial year 1990-2019 to get the results. The data is generated form the official website of Nepal Rastra Bank

3.1.13 Import of Agricultural food Products

Import of agricultural food products refers to the total value of importing agricultural food products in Nepali rupees during the study period. The 30 years of data have been used starting from the financial year 1990-2019 to get the results. The data is generated form the official website of Nepal Rastra Bank

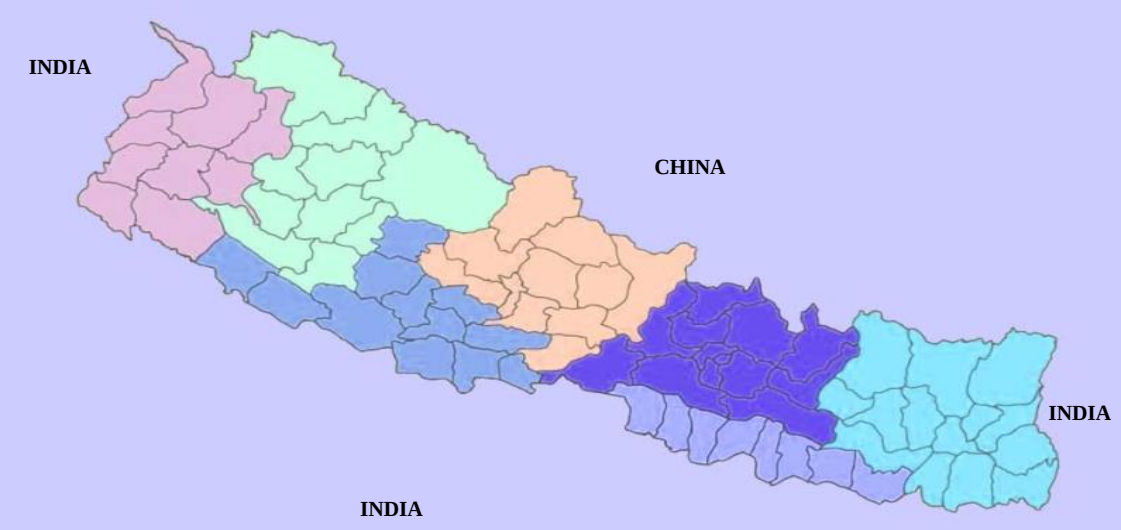


Figure 3.1: Map of Nepal

Source: Nepal Rastra Bank

3.2 Study Area

The study area of my research is the country, Nepal. which lies between two economically big countries namely China and India. The total area of Nepal is 147181 Sq. KM. and the total population is 29,192,480 among then 48.96% is the population of males and 51.04 is the population of females. The majority of the population belongs to a female. Two third of the total population depends on agricultural income as the primary source of Income. Total export for the financial year of 2021/22 is 118, 851.00 million Nepali rupees and on the other hand, a total amount of 999,342.70 million Nepali rupees has been imported during the year. The country has a total of 1,734,467.20 million rupees of total government outstanding which is 40.70% of the total GDP. So, I am dealing with import, agricultural food production, foreign currency reserve, productivity, and cultivated areas used.

3.3 Data Analysis

3.3.1 Descriptive Statistical Analysis

The measures of central tendency (arithmetic mean and median), the measures of dispersion (standard deviation, quartile deviation, and range), the measures of skewness and kurtosis as well as other descriptive statistical methods, were used to describe the fundamental characteristics of import, production, and productivity.

3.3.2 Correlation Analysis

The international relationships between agricultural productivity, import, and use of fertilizer were discovered using correlation analysis. The strength of the link was assessed for this using Pearson's correlation coefficient. The range of correlation coefficient values is -1.00 to +1.00, with a negative sign denoting an inverse correlation. Zero means there is no correlation, and 1 means there is a 100% correlation. The 5% level of significance and 95% confidence interval were applied.

3.3.3 Econometric Model

Pesaran has greatly popularized the autoregressive distributed lag (ARDL) method, which has many benefits compared to earlier cointegration techniques like EG (Eagle and Geanger 1987) and JJ's maximum likelihood-based tests (Johansen and Juseliua 1990) (Ghimire *et al.,* 2021). It is easy to determine whether a long-term relationship is close by using the ARDL approach without taking into account the series that is stationary at levels [I (0)] or first difference [I (1)], or a combination of both (Chandio *et al.,* 2018). The ARDL strategy is extremely dependable when there is a small sample size and maintains the strategic distance from the issue of endogeneity and makes a difference to look at the long-term coefficients. ARDL F-stat is utilized to look at the relationship over time between the study variables chosen. We can reject the null hypothesis and infer that the cointegration occurs if the F-statistic value is significantly larger than the I (1) bound (Chandio *et al.,* 2021b). The lag order of the ARDL model is selected automatically by Eviews software.

The ARDL can be tested with variables that are stationary at various integration levels and do not need the very same order of integration. Additionally, this strategy can be used with a small amount of data. Additionally, we have a suitable sample size. These two aspects of our time series data allowed us to employ the ARDL approach of the cointegration test (bound test).

After confirming the cointegration through a bound test of the long-run relationship between the dependent and independent variables of the model, we employed the FMOLS and CCR methods of cointegration. CCR is also used to test the robustness of the model tested by the DOLS method. These cointegration tests are performed in past studies of agricultural research (Bhardwaj et al., 2022; Abbas, 2021; Kumar et al., 2021; Zhang et al., 2022). All the models and methods were tested using Eviews. The production growth rate is determined based on the long run coefficient of determinants of cereal production (Table2) and the average growth trend of each determinant derived based on the ARIMA model (Autoregressive moving average model) see in Appendix

To test the determinants of rice production following simple model is developed based on the study of (Chandio et al., 2018).

$$AP = f(AI, MT, EG, ER) \quad (1)$$

Where, AP = Agricultural Food Production, AI = Agricultural Import, MT = Annual mean temperature, EG = Electricity Generation ER= Exchange Rate

The model is further expressed in the form of the following linear form.

$$AP = \beta 0 + \beta 1 AI + \beta 2 MT + \beta 3 EG + \beta 4 ER + \varepsilon t \quad (2)$$

Compared to the simple linear model, the log-linear model, which was created from the linear combination, produces findings that are acceptable and competent. Equation 2 can be converted into a log by doing the following:

$$\ln AP = \beta 0 + \beta 1 \ln AI + \beta 2 \ln MT + \beta 3 \ln EG + \beta 4 \ln ER + \varepsilon t \quad (3)$$

The variables under the log-linear model (3) are tested for stationarity by using Dicky fuller test which suggested the use of the autoregressive distributed lag model.

The following software applications were used to analyze the study's variable:

For data analysis of data MS Excel, SPSS and E-views software was utilized.

CHAPTER IV: RESULTS AND DISCUSSION

4.1 Paddy

4.1.1 Paddy production in Nepal

Nepal is located in South Asia with facilities of 280 N and 840 E and is arranged in China in the north and all sides have been covered by India. With 1.89 billion people or one-fourth of the world's population, south Asia is an area that heavily relies on agriculture for employment and subsistence (Economics & Library, n.d.-b). Topographically Nepal is separated into five regions: The Himalayas, High Hills, Mid Hills, Siwalik, and Terai (M. Paudel, 2013). Rice is consumed by billions of individuals and is the foremost common staple food of a huge number of individuals on earth, the fact is it feeds more people than any other crop (Wassmann et al., 2009). Rice is the major cereal crop grown in three major zones: terai, Mid-hills, and high hills of Nepal (Malla et al., 2022). Nepal has been an overwhelmingly agricultural-based economy, with over 70% of households directly or indirectly depending on agriculture-based work to meet their day-to-day needs. Out of 77 districts, we can find that 75 districts have grown rice. Manang and Mustang are unable to grow rice because of climatic conditions.

It is to say that even the individuals of Nepal who do not eat rice as their primary diet suggest that eating rice is a prestigious food compared to other foods (M. Paudel, 2013). Rice could be a staple crop of Nepal and is straightforwardly related to plentiful water and lease fluctuation of temperature that might influence its production and productivity (Sapkota et al., 1970). The research result demonstrates that climate change influences rice production through temperature and precipitation impacts (Sinnarong et al., 2019). The world's agricultural and natural resources systems are already struggling to meet the rising food demand in many nations, and climate change adds another challenge to these systems (Basnet, 2012).

The agricultural sector is known as one of the most vulnerable sectors to climate change because the overall growth of this sector mainly depends upon climate and climate conditions (Sinnarong et al., 2019). Climate change plays a very significant role in the overall product development of the agricultural sector in Nepal. For the nation's development, the Agribusiness sector plays a very important role in providing job

opportunities and for the country's economic advancement (Lee et al., 2019). Due to its importance different NGOs, INGO, and government policymakers are actively involved in the development of the agricultural sector in Nepal.

The productivity and sustainability of rice production are undermined by biotic and abiotic stresses, and the impact of these stresses can be exasperated by dramatic global temperature changes (Ayinde et al., 2013). We found that the rise in temperature decreases the annual productivity and increases the inconsistency in productivity So, also an increment in temperature change would moreover reduce the mean of rice productivity but increment its inconstancy which will be more impacted the gross domestic rice production of the country. Small agriculturists in numerous developed and developing countries have been altering their management practices in response to climate change impacts (Khanal et al., 2018).

Previous research shows that the total cost per unit ranges from $28.34 to $32.79 whereas per unit's total income ranges from $33.4 to $49.02 (Devkota et al., 2018). The average cost per unit is $30.565 whereas the total average income is $41.21 and the profit per unit on average is $10.635. Shockingly, it is observed that farmers who don't receive any adaptation option can get the highest income per unit generation. However, due to low and poor knowledge about the arrangement of natural and organic fertilizers agriculturists have been able to produce a low level of production and income (Amgai, 2021).

Table 4.1 Descriptive statistical analysis of Paddy in Nepal

		Cultivated Area	**Production**	**Productivity**
N	Valid	40	40	40
Mean		1465.73357	3923.189543	2.66263
Std. Error of Mean		11.735352	147.5258636	.091530
Median		1471.50696	4027.000000	2.63000
Mode		1549.000	1833.0000a	2.720
Std. Deviation		74.220883	933.0354853	.578887
Variance		5508.739	870555.217	.335

Skewness	-.881	-.015	.292
Kurtosis	.523	-.541	-.446
Std. Error of Kurtosis	.733	.733	.733
Range	295.000	3788.7097	2.365
Minimum	1265.000	1833.0000	1.450
Maximum	1560.000	5621.7097	3.815
Sum	58629.343	156927.5817	106.505

Production is one of the most important parameters for the development and increase in the export side of the counter and which also helps to reduce the trade loss of the nation. The analysis of the forty years of data shows that the mean production of paddy is 3923.1895 where the production was range from 1833 to 5621 thousand metric tons which is equal to the productivity of 1.450 to 3.815 metric tons per hectare. This clears that there are huge fluctuations in paddy production in Nepal. The skewness of the production side is -0.015 which seems that data is positively skewed and there is a continuous increment of production of the paddy each year. The mode of production is 1833 metric tons per year which are also known as the most occurred value in the data which represents that at the time of 40 years, the lowest production has frequently occurred.

The standard deviation of 933 represents that the data has deviated by 933 from the average production. The range of products is a 3788-thousand-hectare scale which represents the difference between the highest and lowest production. This indicates that there is a huge difference from highest to lowest production. Where the minimum is 1833 thousand metric tons per hectare and the maximum is 5621 thousand metric tons in a year. The total paddy production from 1981/82 to till 2020/21 is 156927.58 thousand metric tons by using the land of 58629.34-thousand-hectare scale with the ratio of 2.67 thousand metric tons per hectare scale.

The cultivated area of Nepal is limited and the government has to produce more products in the limited area by the maximum utilization of the available resources. The high productivity on the limited cultivated land has contributed more to the development of the nation. The analysis of the forty years of data shows that the mean

cultivated area used for production is a 1465-thousand-hectare scale. The minimum use of cultivated land is 1265 thousand hectares scale and the maximum use of cultivated land is 1560-thousand-hectare scale. The skewness of the cultivated land -is .881which is highly skewed data.

The mode of using cultivated land is a 1549-thousand-hectare scale which is also known as the most occurred value in the data which represents that at the time of 40 years, the cultivated land for the production of paddy has been widely used. The standard deviation is 74 which represents that the cultivated land has deviated by a 74-thousand-hectare scale from the average used cultivated land. The maximum productivity of the paddy is 3.815 in one year which indicates that Nepal will be able to increase the productivity of the paddy more than the highest productivity.

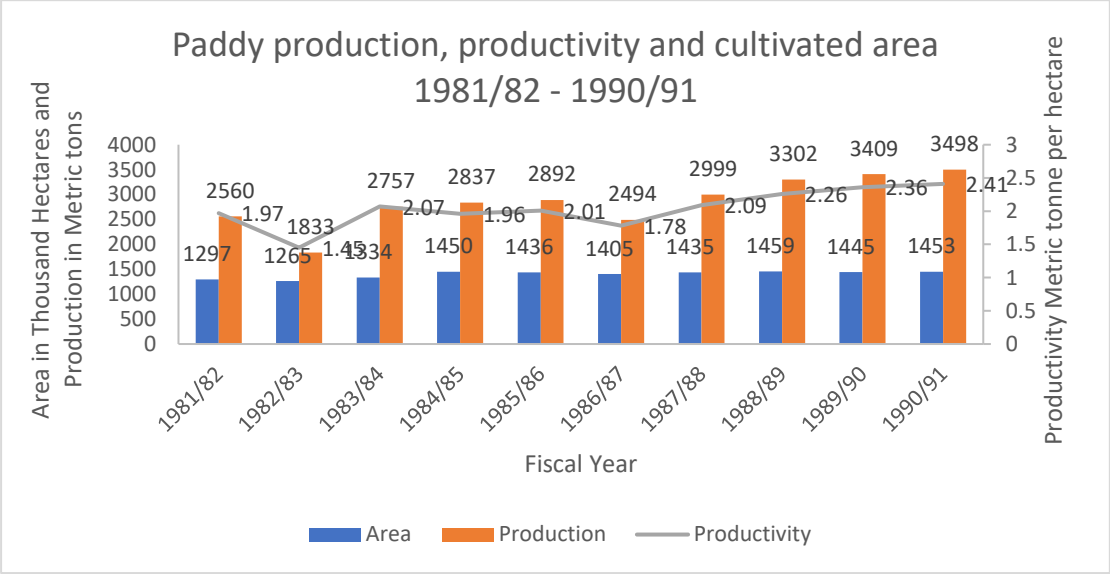


Figure 4.1 Information on Paddy production from 1981/82 to 1990/91

The graph shows the relationship between total production, productivity and the cultivated area from the financial year 1981/82 to 1990/91. Each year the production of paddy is climbing on increasing trends except 1986/87. During the ten years, the production of paddy increased by 36% from 2560 Metric tons in 1981 to 3498 tons in 1990. This reflects the good productivity of pay production in Nepal.

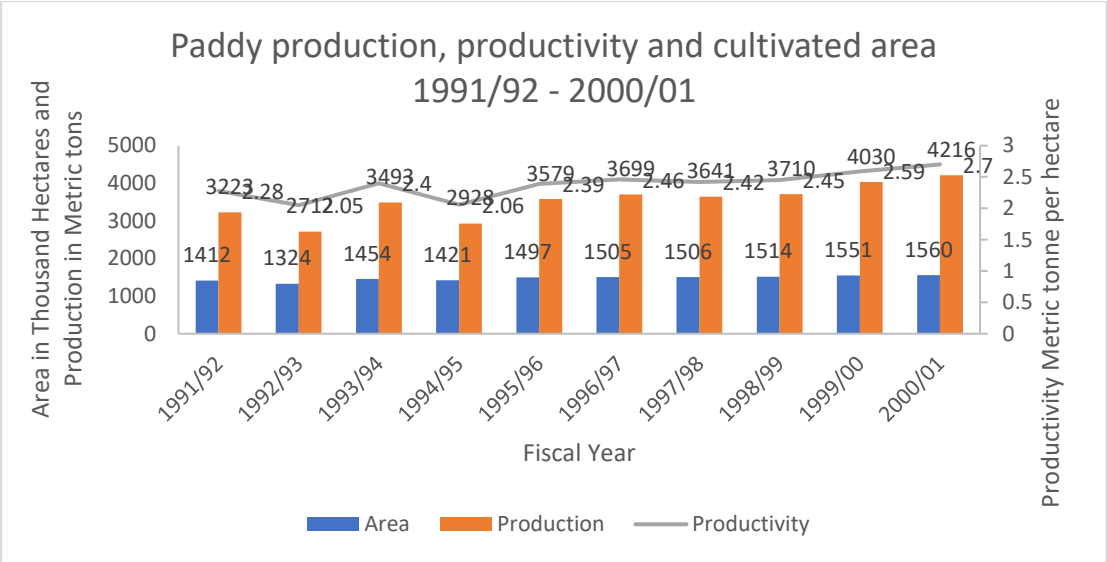


Figure 4.2 Information on Paddy production from 1991/92 – 2000/01

Comparing the data of the last decade, the production has decreased last decade although there is an increment in the cultivated land. Which will impact the gross domestic product of Nepal. Each year the production of paddy is climbing on increasing trends except 1991/92. During the ten years, the production of paddy increased by 30.80% from 3223 Metric tons in 1991 to 4216 tons in 2000. This reflects the good productivity of paddy production in Nepal.

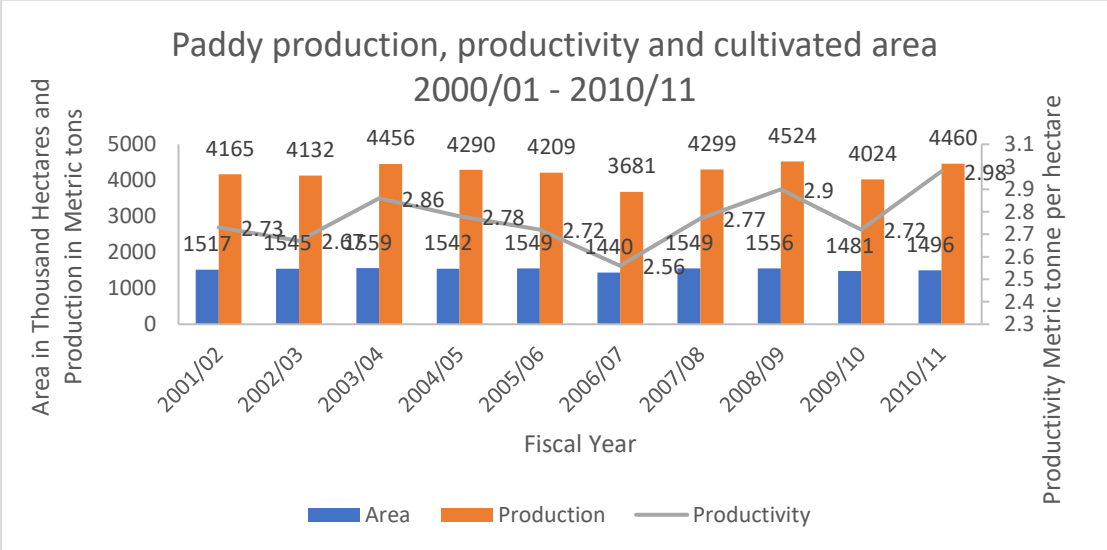


Figure 4.3 Information on Paddy production from 2001/02 – 2010/11

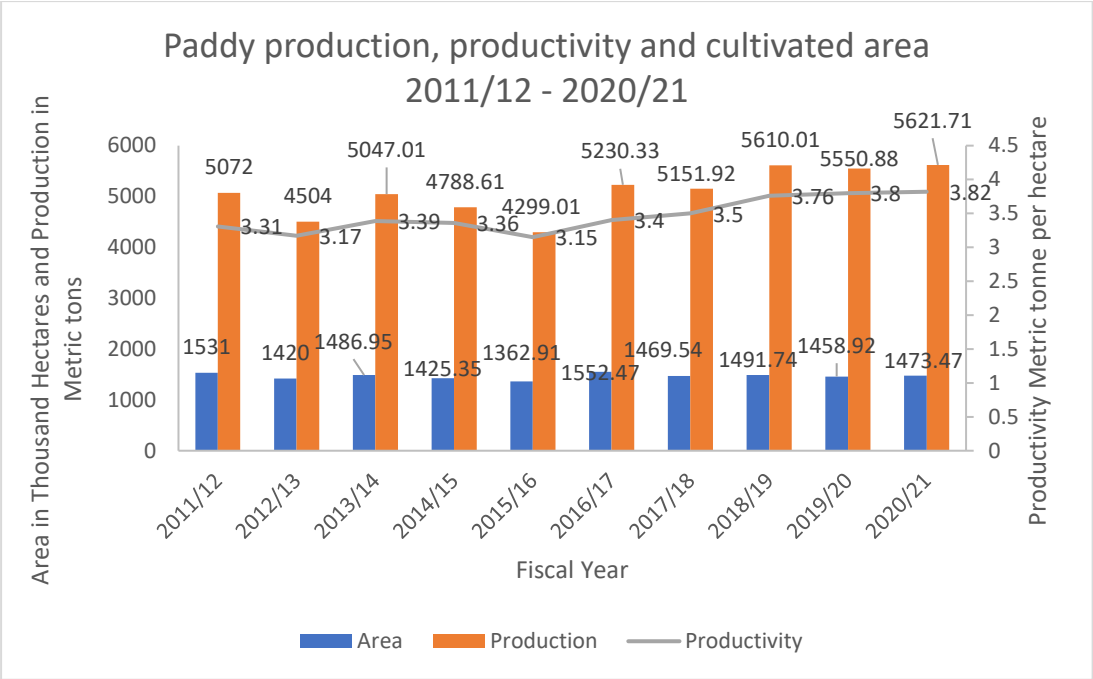


Figure 4.4 Information on Paddy production from 2011/12 – 2020/21

Comparing the paddy production of ten years there is no steady growth in paddy production in Nepal there is no huge increment in production and comparing the area covered by the agricultural land which seems to be not increased in increasing trend but the yield seems to be increased in the increasing trend and reached 2.40. To promote the export of paddy in Nepal the government must push the production for the development of the financial sector and to motivate and promote local products in Nepal. The total productive land of Nepal has not been fully utilized.

Rice is the dominant food that is broadly consumed by 3 billion people in the world. In Asia, about 90% of the world's rice is produced and consumed (Chandio et al., 2020). Rice is a major cereal crop developed in three agroecological zones they are Terai, mid-hills, and high hills of Nepal, accounting for almost 50% of the entire agricultural cultivated area and total production in Nepal (Malla et al., 2022). Nepal has watched changing temperatures, with a 0. .04ºC increment per year in Terai and a 0.09ºC increase per year within the Himalayas, but in the winter there is a higher rate of increment (Phuyal et al., 2017).

Nepal is among the world's least developed countries and is very vulnerable to the impacts of climate change. Nepal is an agriculture-based country located in South Asia.

The agrarian division plays a driving part in the economy, contributing 26.98% to the GDP and utilizing two-thirds of its labor force (Chandio et al., 2021). The practice of importing rice from India is rising. The establishment of milling enterprises in the border corridor on the Inside with help from the state government, significant subsidies in the production of rice itself in the bordering Indian States of Bihar and Uttar Pradesh, and a scarcity of paddy rice in the area are some of the factors cited by the players (N. P. Joshi et al., 2017).

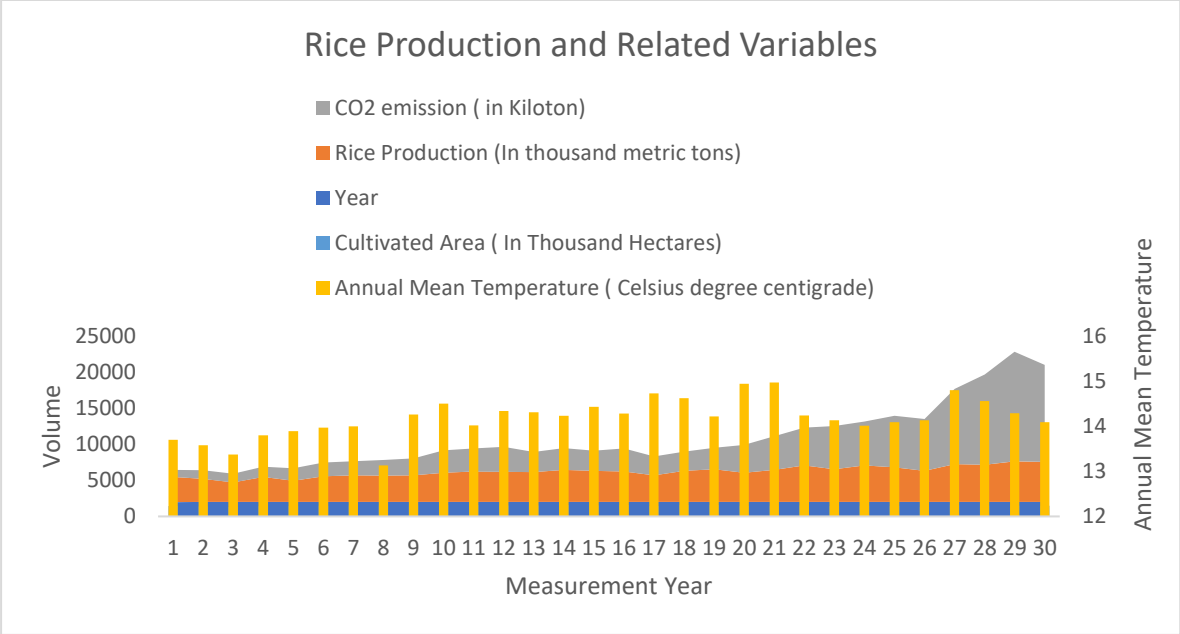


Figure 4.5 Rice production and related variables

The above graph is representing thirty years of data which was starting from 1990 to till 2019. In the graph, we are, showing and analyzing the impact of rice production by analyzing four indicators Rice production is taken as the dependent variable, and CO2 emission, cultivated area, and Annual mean temperature are taken as the independent variable. The volume of CO2 emission is taken as Kiloton, Rice production is taken as one thousand metric tons, cultivated areas are taken as a thousand Hectares and Annual mean temperature is taken as Celsius degree Centigrade. On the graph, the CO2 emission seems to increase every year. Although the population has increased each year rice production has not increased which is a great challenge for the government for the increment of agricultural products in Nepal. The annual mean temperature has fluctuated each year. Increasing and decreasing trend always takes place which is

because of climate change. We can say that climate change has impacted overall rice production in Nepal which must be resolved on time to meet the demand for rice production and make a self-dependent of rice production in Nepal.

4.2 Maize

4.2.1 Maize production in Nepal

Regarding the area of production, paddy is Nepal's most significant crop, followed by maize. For the producers in Nepal's hills, it is a daily routine. The crop is typically farmed for food, feed, and fodder. In recent decades the demand for maize has already been steadily increasing by roughly 5% yearly (KC et al., 2015). Nepal is not growing maize production and productivity in Nepal. Besides that, there are lots of hidden causes that must be resolved on time. So, that Nepal will be able to export maize products from Nepal. Under the guise of relatively stable productivity because of limited growth, low return potential of existing genetic variables, imported quality seeds, decreasing soil nutrients, and the introduction of new agricultural pests, labor, and water, the traditional technology must be converted into an advanced, resource-efficient and climate-smart system.

It is discovered that the cultivation of maize in Nepal's terai and hills offers a relative advantage when taking into account the local resources employed in the process. The typical resource cost to revenue is in other words costs 0.78 dollars and 0.62 dollars equivalents in locally available resources in the hillsides and terai, accordingly to develop one single dollar of the maze. It proves that developing maize domestically rather than importing benefits (B. K. Joshi & Paudyal, 2004). It demonstrated the necessity for enhancing high return, cultivated varieties types in addition to the invention of hybrid varieties to meet the demand of the feed industry. Through assistance from Nepal Maize Research, a few community-based germinating seeds organizations in the districts of Jhapa, Dhangadhi, Dang, and Rupandehi have recently begun to produce hybrid seeds of the Rampur hybrid-8, Rampur hybrid-10, and Khumla hybrid-2. This may contribute to lowering the import of maize in the ensuing years (Gairhe et al., 2021).

Table 4.2 Descriptive statistical analysis of Maize production in Nepal

		Cultivated Area	**Production**	**Productivity**
N	Valid	40	40	40
	Missing	0	0	0
Mean		809.65	1627.10	1.96
Std. Error of Mean		17.92	92.184800	.074
Median		825.50	1497.50	1.81
Mode		870.000	718.000a	1.410
Std. Deviation		113.39	583.02	.472317
Variance		12858.288	339921.492	.223
Skewness		-1.373	.577	.710
Std. Error of Skewness		.374	.374	.374
Kurtosis		2.582	-.334	-.481
Std. Error of Kurtosis		.733	.733	.733
Range		504.776	2281.733	1.722
Minimum		475.000	718.000	1.340
Maximum		979.776	2999.733	3.062
Sum		32386.112	65084.365	78.470

Maize is the second most produced crop in Nepal. And the production of maize is one of the most important parameters for the development and increase in the export side of the counter and which also helps to reduce the trade loss of the nation. The analysis of the forty years of data shows that the mean production of Maize is 1627.10 thousand metric tons and the production was range from 718 to 2999.733 thousand metric tons which is equal to the productivity of 1.340 to 3.062 metric tons per hectare. This clears that there are huge fluctuations in maize production in Nepal. The skewness of the production side is .577 which seems that data is moderately skewed and there is a continuous increment in the production of maize each year. The mode of production is 718 metric tons per year which are also known as the most occurred value in the data which represents that at the time of 40 years, the lowest production has frequently occurred.

The standard deviation of 583.027 represents that the data has deviated by 583.027 from the average production of maize. The range of products is a 2281-thousand-hectare scale which represents the difference between the highest and lowest production. This indicates that there is a huge difference between the highest to lowest production of maize production in Nepal. Where the minimum is 718 thousand metric tons per hectare

and the maximum is 2999.733 thousand metric tons in a year. The total maize production from 1981/82 to till 2020/21 is 65084.365 thousand metric tons by using the land of 32386.112-thousand-hectare scale with the ratio of 1.96 thousand metric tons per hectare scale.

The cultivated area of Nepal is limited and the government has to produce more products in the limited area by the maximum utilization of the available resources. The high productivity on the limited cultivated land has contributed more to the development of the nation. The analysis of the forty years of data shows that the mean cultivated area used for production is 809.65-thousand-hectare scale. The minimum use of cultivated land is 475 thousand hectares scale and the maximum use of cultivated land is a 979.66 thousand-hectare scale. The skewness of the cultivated land is -1.373 which is highly skewed data.

The mode of using cultivated land is an 870-thousand-hectare scale which is also known as the most occurred value in the data which represents that at the time of 40 years, the cultivated land for the production of maize has not been satisfactorily used. The standard deviation is 113 which represents that the cultivated land has deviated by a 113-thousand-hectare scale from the average used cultivated land. The maximum productivity of the maize is 3.062 in one year which indicates that Nepal will be able to increase the productivity of maize more than the highest productivity. Comparing the productivity of maize with paddy it seems that there is low productivity of maize than paddy in Nepal.

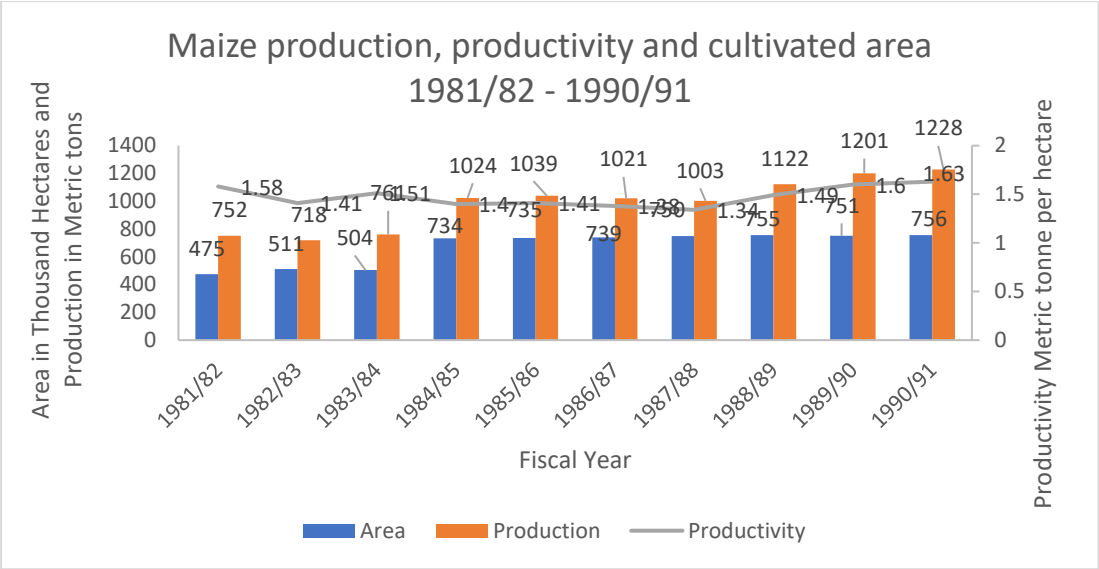


Figure 4.6 Information on Maize production from 1981/82 to 1990/91

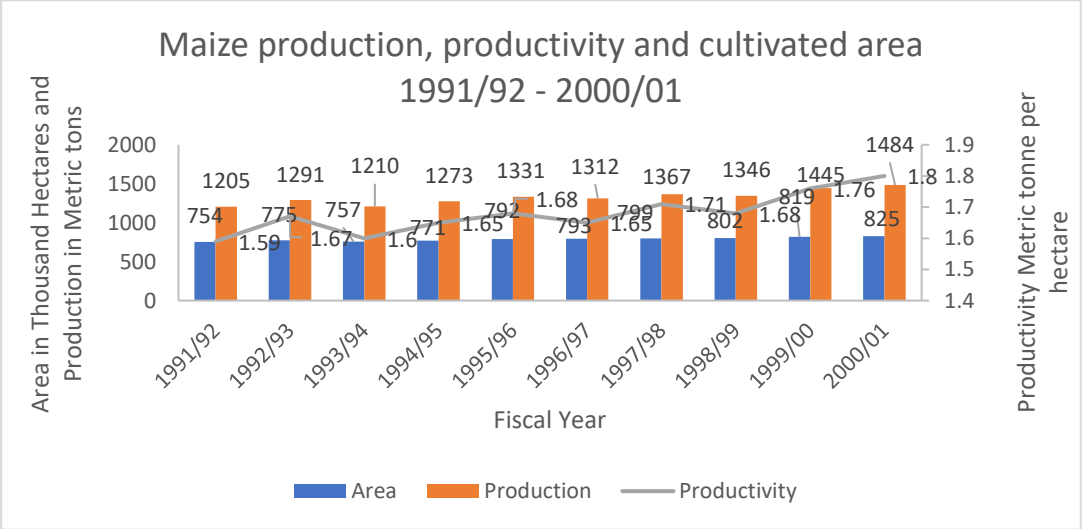


Figure 4.7 Information on Maize production from 1991/92 to 2000/01

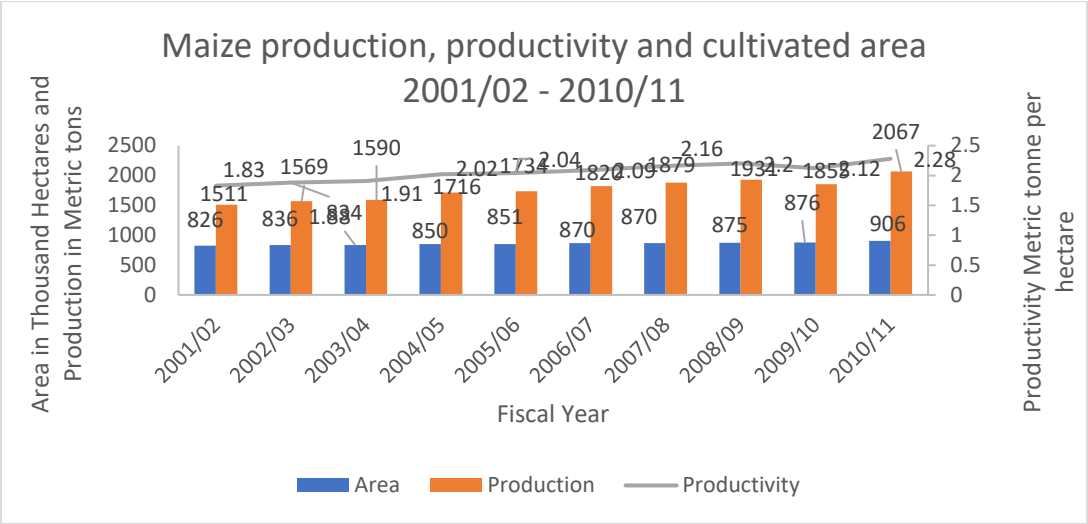


Figure 4.8 Information on Maize production from 2001/02 to 2010/11

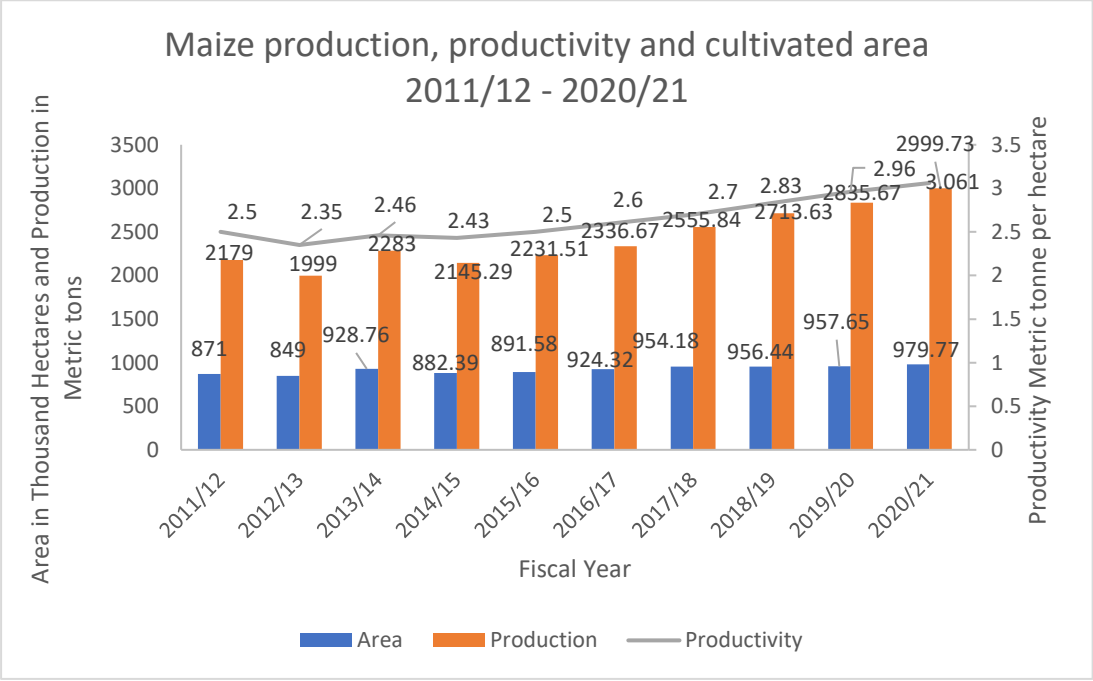


Figure 4.9 Information on Maize production from 2011/12 to 2020/21

Nepal is still not self-sufficient in maize production and for the fulfillment of the demand in Nepal, there is a need to import. Which is an extra burden for the Nepali economy. Nepal needs to input more to grow maize in Nepal. There are a lot of issues with maize production in Nepal are related to lack of technical manpower, inadequate technical knowledge, unscientific cultivation methods, expensive seeds, scarce and expensive inputs, inadequate infrastructure and investments from public and private

sectors, as well as lack of research, are the main issues for the development of maize production in Nepal (Kandel, 2021).

The most recent study provides answers to three important questions, including how climate change affects maize production, whether there is a causal relationship between climate change and maize production, and how non-climatic factors such as cultivated area, fertilizer used and credit availability can improve maize production in the context of Nepal. According to the findings, maize production was negatively impacted by CO2 emissions, temperature, and both the long-run and short-term effects of precipitation, respectively. In addition, the use of fertilizer and the size of the farmed area both had a big impact on maize yield. This serves as an excellent resource for decision-makers in Nepal's policies around climate change and increased maize output (Chandio et al., 2022). The findings are very useful for the decision-makers and the policy formulators to grow maize in Nepal. This will also help to decrease maize imports in Nepal and contribute to the financial status of Nepal.

The trend line of maize production in Nepal is in increasing trend besides that which is not satisfied and fulfills the demand of the nation. In the financial year, 1981/1982 the production area of 475 thousand hectares in Nepal can grow 752 metric tons of maize which are equal to the productivity of 1.58 metric tons per hectare. In other words, in one hectare the production of maize was 1.58 metric tons. After 20 years that is the financial year of 2001/2002, we have analyzed the data and found that the cultivated area has increased by 353 thousand hectares and reached 828 thousand hectares on the other hand in one same year Nepal can grow 1511 metric tons of maize production which is equal to the productivity of 1.83 metric tons per hectare.

It seems that the productivity is increasing but at a very slow pace and will not fulfill the demand of the nation still Nepal will depend on the import side for maize in Nepal. After analyzing the trend for 20 years from 2001 to 2002 we found that the cultivated area increased by 153.78 thousand hectares and the total maize cultivated area reached 979.78 thousand hectares in the same year Nepal can grow 2999.73 metric tons of maize production which is equal to the productivity of 3.06 metric tons per hectare. This is good for the nation because the contribution of maize production is increasing each year

besides that the population of the nation is also increasing and deforestation has also been seen which will create serious problems for climate change in Nepal.

4.3 Wheat

4.3.1 Wheat production in Nepal

In Nepal, wheat is produced in both subtropical and temperature climates. The third largest food crop in Nepal is wheat. Presently, 1.57 million metric tons of wheat are exported from the nation. For better production, the average daily temperature should vary between 20oC and 25oC with the lowest and highest temperatures during the wheat planting period being 30oC to 32oC (J. L. Nayava et al., 1970). For the good production of wheat there is a need and maintain a good climate. Temperature plays an important in the mass production of wheat. In Nepal terai seems to be a more favorable climate and the hilly mountain is not suitable for the good production of wheat in Nepal.

Wheat has different challenges and diseases in its production and development worldwide. The stem rust race (Ug99) has become a great threat globally. The Puccinia graminids triatic race Ug99 fungus, which causes stem or black rust disease on wheat, was discovered for the first time in Uganda in 1998. Seven races from the Ug99 lineage are currently recognized and have expanded to a number of the eastern African highlands' wheat-growing nations, along with Zimbabwe, South Africa, Sudan, Yemen, and Iran. 90% of the wheat types farmed worldwide are susceptible, making the Ug99 set of races a danger to food security and wheat production (Bhandari et al., 2019). Recent research shows that reaper adopter farms save a net advantage of NPR 5592 per ha from harvesting rice and NPR 6313 per ha from harvesting wheat. The overall cost-benefit analysis reveals that the farms with reapers have a benefit-cost ratio of about 5.94 and a payback duration of almost one year with these reaper owners supply services to other farms in exchange for rental fees (G. P. Paudel et al., 2018).

Table 4.3 Descriptive statistical analysis of wheat production in Nepal

		Cultivated Area	Production	Productivity
N	Valid	40	40	40
	Missing	0	0	0
Mean		651.86	1273.87	1.908
Std. Error of Mean		13.31	77.95	.087
Median		665.00	1221.00	1.85

Mode	641.00a	1344.00	1.250a
Std. Deviation	84.227	493.02	.5561
Variance	7094.308	243070.042	.309
Skewness	-.933	.262	.410
Std. Error of Skewness	.374	.374	.374
Kurtosis	1.012	-1.246	-1.098
Std. Error of Kurtosis	.733	.733	.733
Range	367.00	1659.28	1.84
Minimum	400.00	526.00	1.150
Maximum	767.00	2185.28	2.99
Sum	26074.75	50954.894	76.324

Production of wheat is also one of the most important parameters for the development and increase in the export side of the country and which also helps to reduce the trade loss of the nation. The analysis of the forty years of data shows that the mean production of wheat is 1273.87 thousand metric tons and the production was range from 526 to 2185.28 thousand metric tons which are equal to the productivity of 1.150 to 2.99 metric tons per hectare. This clears that there are huge fluctuations in wheat production in Nepal. The skewness of the production side is .262 which seems that data is moderately skewed and there is a continuous increment in the production of wheat each year. The mode of production is 1344 metric tons per year which is also known as the most occurred value in the data which represents that at the time of 40 years the production which is greater than the average mean has frequently occurred.

The standard deviation of 493.02 represents that the data has deviated by 493.02 from the average production of wheat. The range of products is a 1659-thousand-hectare scale which represents the difference between the highest and lowest production. This indicates that there is a low fluctuation in Wheat production as compared with paddy and maize production in Nepal. Where the minimum is 526 thousand metric tons per hectare and the maximum is 2185.28 thousand metric tons in a year. The total maize production from 1981/82 to till 2020/21 is 50954.894 thousand metric tons by using the land of 26074.75-thousand-hectare scale with the ratio of 1.908 thousand metric tons per hectare scale.

The cultivated area of Nepal is limited and the government has to produce more products in the limited area by the maximum utilization of the available resources. The

high productivity on the limited cultivated land has contributed more to the development of the nation. The analysis of the forty years of data shows that the mean cultivated area used for production is a 651.86-thousand-hectare scale. The minimum use of cultivated land is 400 thousand hectares scale and the maximum use of cultivated land is a 767 thousand-hectare scale. The skewness of the cultivated land is -0.933 which is moderately skewed data.

The mode of using cultivated land is a 641-thousand-hectare scale which is also known as the most occurred value in the data which represents that at the time of 40 years, the cultivated land for the production of wheat has not been satisfactorily used. The standard deviation is 84.227 which represents that the cultivated land has deviated by an 84.227-thousand-hectare scale from the average used cultivated land. The maximum productivity of maize is 2.99 in one year which indicates that Nepal will be able to increase the productivity of wheat more than the highest productivity. Comparing the productivity of maize, paddy, and wheat it seems that wheat has the lowest productivity among the other three crops.

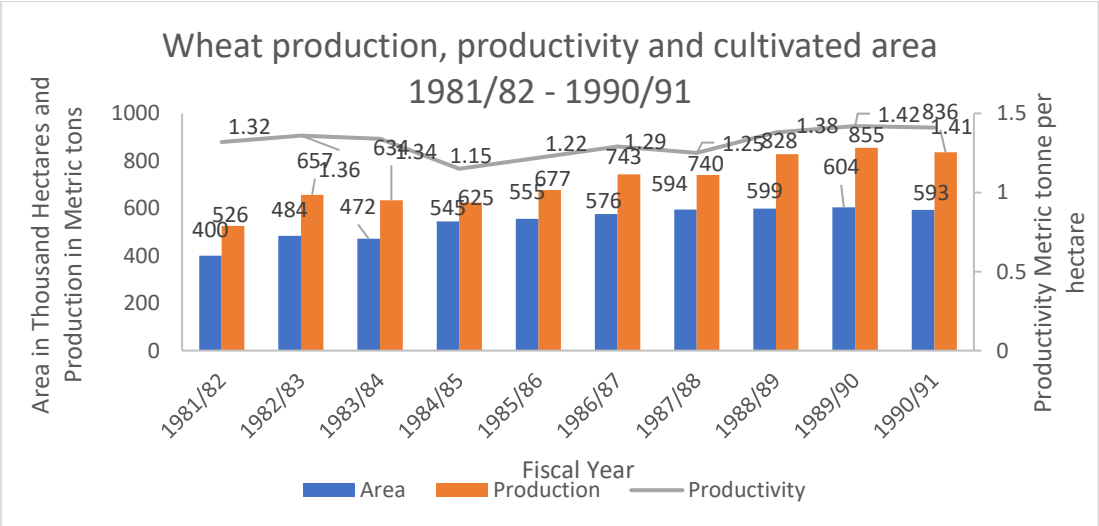


Figure 4.10 Information on Wheat Production from 1981/82 to 1990/91

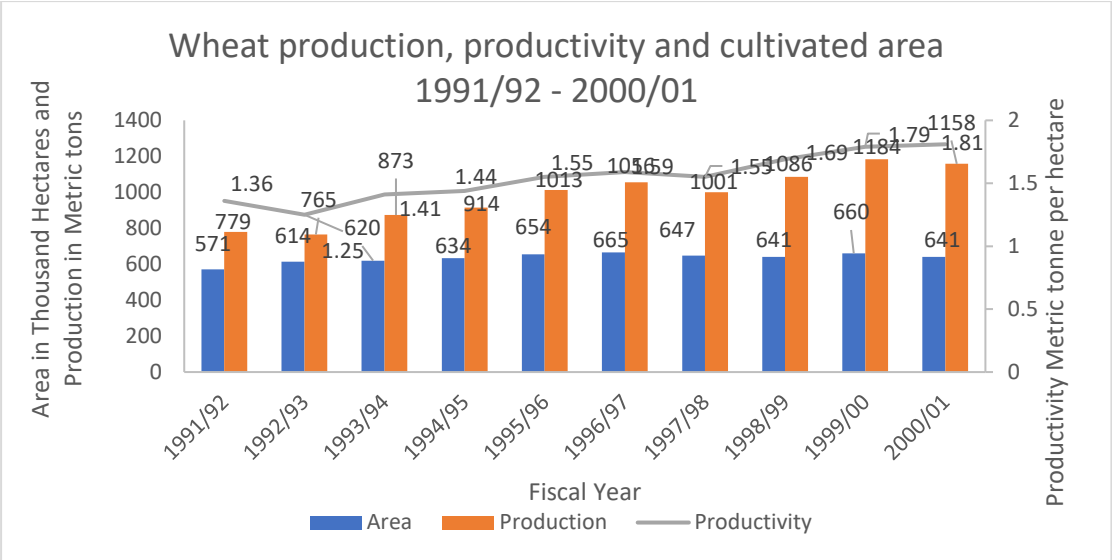


Figure 4.11 Information on Wheat Production from 1991/92 to 2000/01

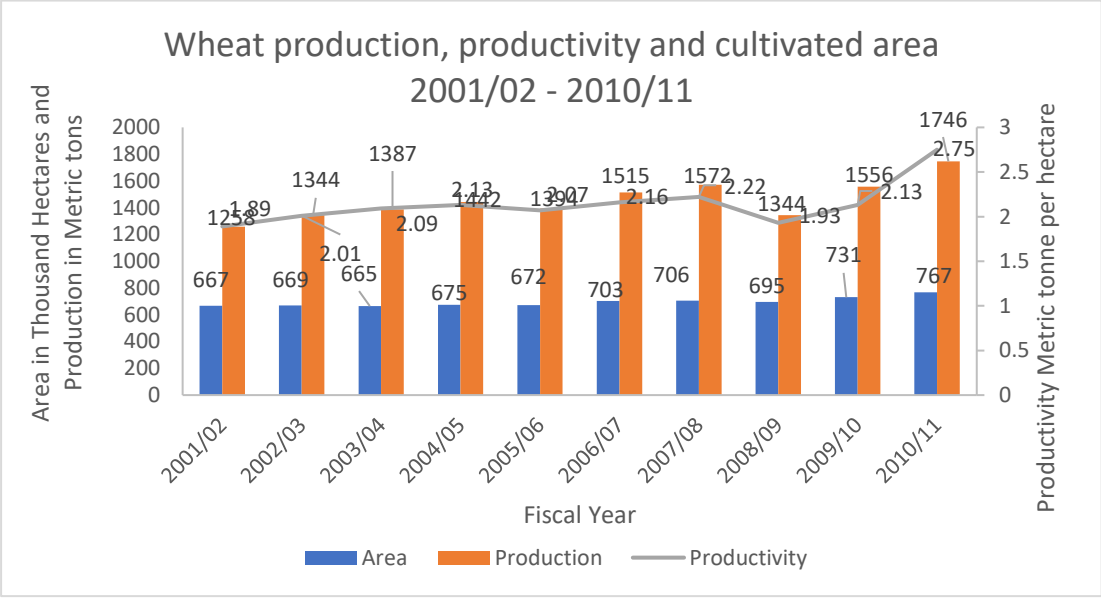


Figure 4.12 Information on Wheat Production from 2001/02 to 2010/11

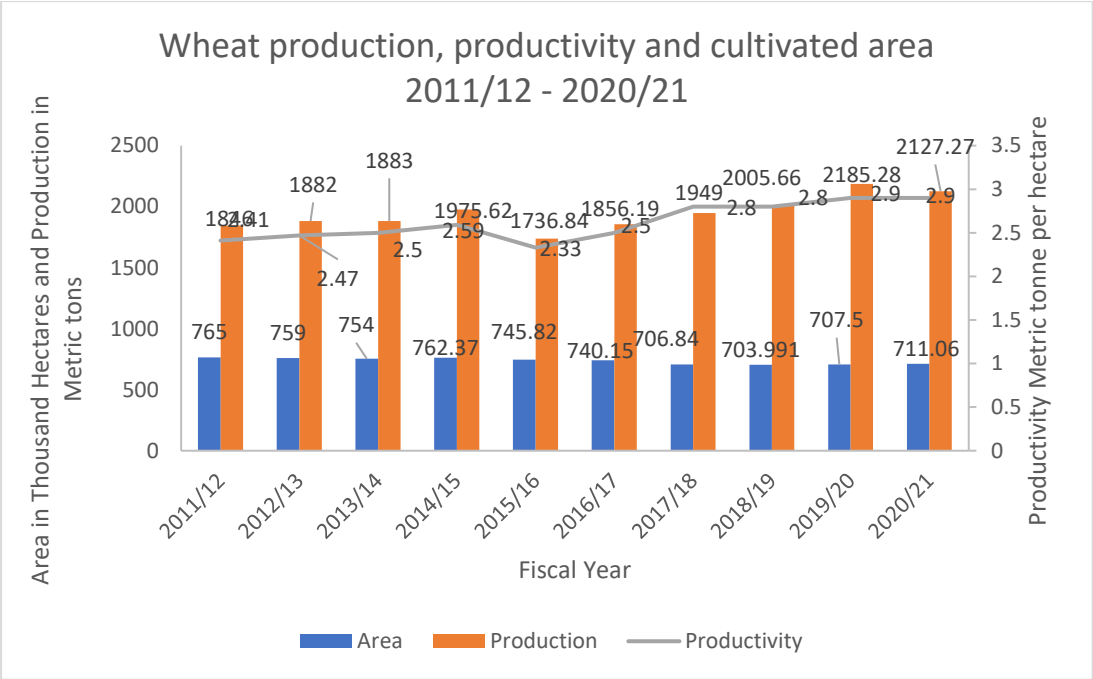


Figure 4.13 Information on Wheat Production from 2011/12 to 2020/21

Wheat is widely adaptable due to its presence in all three agro-climatic areas of the nation, from sea level to 4000-meter scale. Terai contributes 64.3% of the world's wheat production and shares 57.37% of the wheat-growing land. Similar to how hills and mountains share 35.94% and 6.69% of the wheat land and contribute 31.2% and 4.5% respectively to total wheat production (Bhandari et al., 2019). In Nepal, the timing of wheat sowing is rigorously adhered to in the rice-wheat and cotton-wheat cropping patterns. So, we can say that terai is the most favorable for wheat production in Nepal and the majority of the production has been done in the Terai region of Nepal.

According to research, in the Terai and Siwalik hill plains of Nepal, 84% of the wheat is grown following the rice harvest. In South Asian countries, where rice and wheat are still traditionally grown together, notably Nepal, the delay in growing wheat poses a major concern (Thapa et al., 2020). The mid-hills of Nepal have a lot of potentials to boost wheat growth in places with the same soil pedogenic classes been considered in the latest research and the research shows that up to 50%, more total bioenergy can be produced by the maize-wheat combination by cultivating medium-duration or even lengthy maize cultivars.

Smallholder farmer's choices of maize maturity types cannot be restricted by growing degree days restrictions in regions where seasonal weather conditions are above 14oC, whereas small farmers in surroundings with the lowest wheat planting windows and the most constrained selection of maize maturity types will experience these issues in environments with normal seasonal temperature levels of 14oC or lower (Laborde et al., 2019). So, what is most sensitive to the climate? If climate favors production, then productivity has increased and if rainfall or natural disaster disturbs it then productivity has decreased.

The trendline of wheat for 40 years has been analyzed and the trend has been divided into two parts first 20 years and then the next 20 years. In 1981/82 on a total of 400 thousand hectares of cultivated land, total wheat was produced by 526 thousand metric tons which is equal to the productivity of 1.32 metric tons per hectare. This means in the one-hectare scale of cultivated land there is a production of 1.32 metric tons of wheat. After 20 years from 1981/82 that is 2000/2001 the cultivated area has increased by 241 thousand hectares and reached 641 thousand hectares and at the same time, the production also increased and reached 1158 thousand metric tons not only area and production increased besides that the productivity has also increased during the 20 years and reached to 1.81 metric tons per hectare which are because of modern technology and technical and experienced person at that field.

And after analyzing recent 20 years of data the cultivated area has increased by 70.07 thousand hectares and reached 711.07 thousand hectares on the other hand production side has also increased at a good pace compared to the last 40 years and the productivity has reached 2.99 metric tons per hectare along with the production of 2127.48 thousand metric tons which is the highest productivity of maize production in Nepal. Nepal's government is also providing support to the wheat-growing farmers from different sectors besides that new modern technology, innovation, research, and development also plays important role in growing wheat production in Nepal. But still, we are not able to fulfill the total demand of the nation which tend to increase in import because of the increasing population in Nepal.

4.4 Barley

4.4.1 Barley production in Nepal

Barley is fourth among the most important cereal grain crops, behind rice, maize, and wheat. It is a self-pollinating, diploid crop with 14 chromosomes. The top four producers of barley are Russia, Germany, France, and Ukraine. Barley is grown on 49.60 million ha of land and produces144.26 million tons internationally, however, in Nepal, it grows on 21.86 thousand hectors of land and produces 29.43 thousand tons in the 2020/21 fiscal year (Kaur et al., 2019). More barley can be found in food intended for human consumption than in the malting and brewing industry. The production of barley provides several advantages over hulled barley in terms of storage, transporting, and processing. When halls are removed from barley, the bulk density (weight/volume) is increased by about 25%, which results in significant cost savings.

Barley is also known as good food for health. Nepal is still not able to produce a good amount of barley in Nepal and unable to meet the demand of the Nepali people the Nepal government has to import barley to meet the demand of Nepali citizens. The regions of Indochina, Southern China, and India, except its northwest region (the central and southern Asian center), belong to the same west Asian center, while central and eastern China according to Vavilov is part of the east Asian center of origin of cereal crops. Vavilov viewed these areas as one of the two foci of barley origin, along with the areas around Tibet and Nepal. In-depth literary debates have been going on for a long time on how Tibet contributed to the development of cultivated barley (Pomortsev et al., 2012).

Table 4.4 Descriptive statistical analysis of Barley production in Nepal

		Cultivated Area	**Production**	**Productivity**
N	Valid	40	40	40
	Missing	0	0	0
Mean		28.51	29.67	1.04
Std. Error of Mean		.56	.72	.023
Median		28.000	29.21	1.045
Mode		30.00	28.00	1.100
Std. Deviation		3.55	4.59	.145
Variance		12.649	21.077	.021
Skewness		1.380	.460	.425
Std. Error of Skewness		.374	.374	.374

Kurtosis	2.948	.155	-.649
Std. Error of Kurtosis	.733	.733	.733
Range	17.13	20.00	.55
Minimum	21.86	21.00	.80
Maximum	39.00	41.00	1.35
Sum	1140.408	1186.95	41.63

The analysis of the forty years of data shows that the mean production of Barley is 29.67 thousand metric tons and the production was range from 21 to 41 thousand metric tons which is equal to the productivity of 0.80 to 1.35 metric tons per hectare. The skewness of the production side is .460 which seems that data is moderately skewed and there is a continuous increment in the production of Barley each year. The mode of production is 28 metric tons per year which is also known as the most occurred value in the data which represents that at the time of 40 years production which is lower than the average mean has frequently occurred.

The standard deviation of 4.59 represents that the data has deviated by 4.59 from the average production of barley. The range of products is a 20-thousand-hectare scale which represents the difference between the highest and lowest production. This indicates that there is a low fluctuation in Wheat production as compared with paddy, wheat, and maize production in Nepal. The total Barley production from 1981/82 to till 2020/21 is 1186.95 thousand metric tons by using the land of 1140.408-thousand-hectare scale with the ratio of 1.04 thousand metric tons per hectare scale.

The cultivated area of Nepal is limited and the government has to produce more products in the limited area by the maximum utilization of the available resources. The high productivity on the limited cultivated land has contributed more to the development of the nation. The analysis of the forty years of data shows that the mean cultivated area used for production is a 28.51-thousand-hectare scale. The minimum use of cultivated land is 21.86 thousand hectares scale and the maximum use of cultivated land is a 39 thousand-hectare scale. The skewness of the cultivated land is 1.380 which is highly skewed data.

The mode of using cultivated land is a 30-thousand-hectare scale which is also known as the most occurred value in the data which represents that at the time of 40 years, the

cultivated land for the production of wheat has not been satisfactorily used. The standard deviation is 3.55 which represents that the cultivated land has deviated by a 3.55-thousand-hectare scale from the average used cultivated land. The maximum productivity of maize is 1.35 in one year which indicates that Nepal will be able to increase the productivity of barley more than the highest productivity. Comparing the productivity of maize, paddy, wheat, and barley it seems that barley has the lowest productivity among the other three crops.

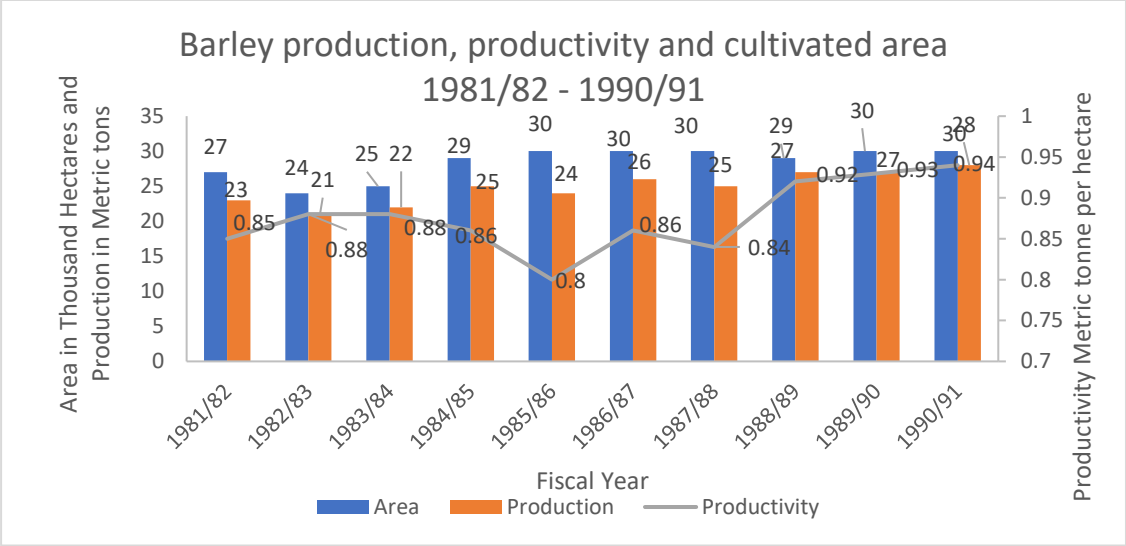


Figure 4.14 Information on Barley Production from 1981/82 to 1990/91

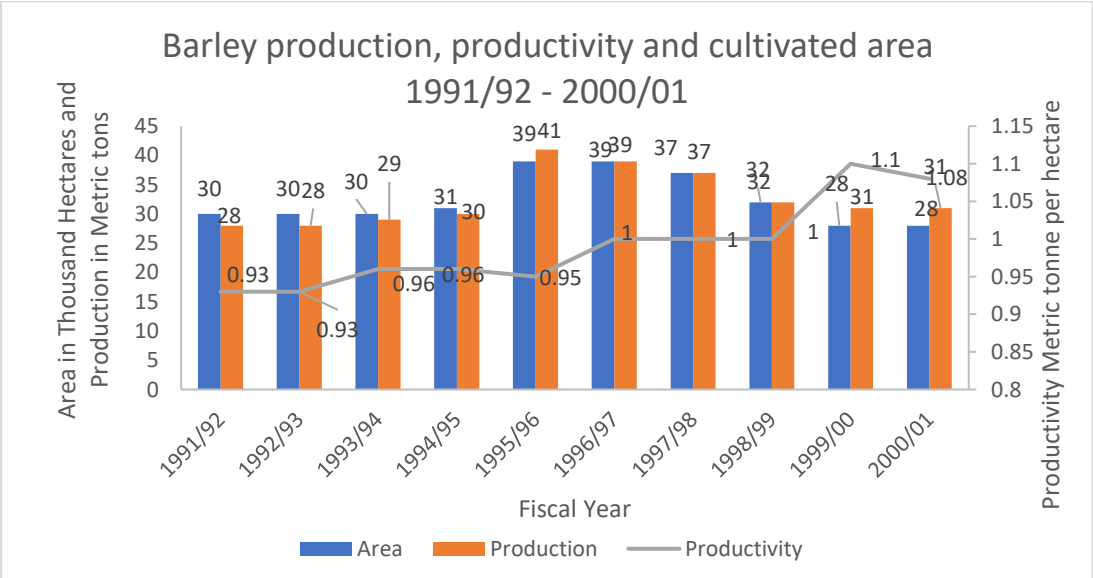


Figure 4.15 Information on Barley Production from 1991/92 to 2000/01

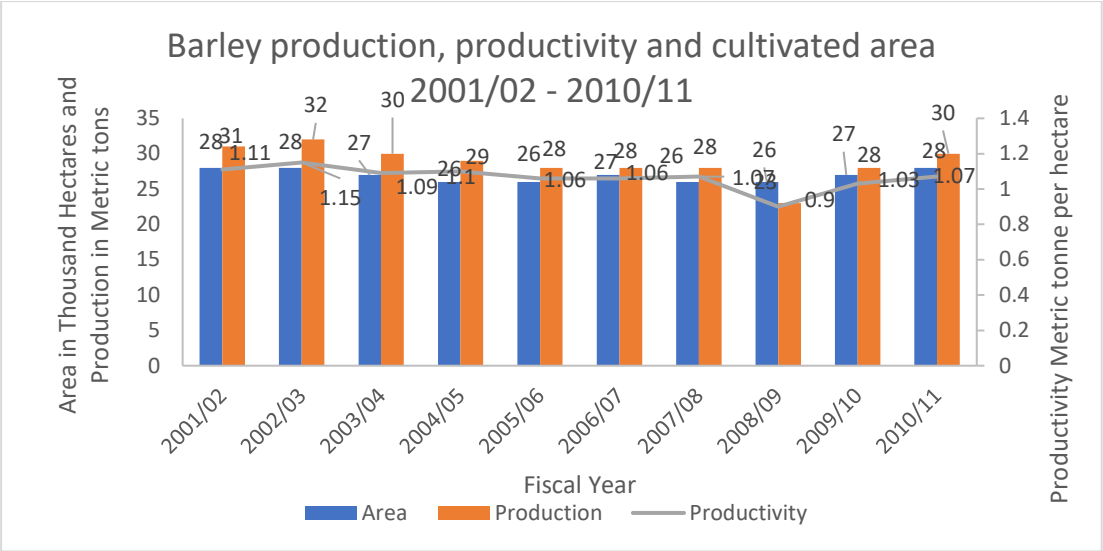


Figure 4.16 Information on Barley Production from 2001/02 to 2010/11

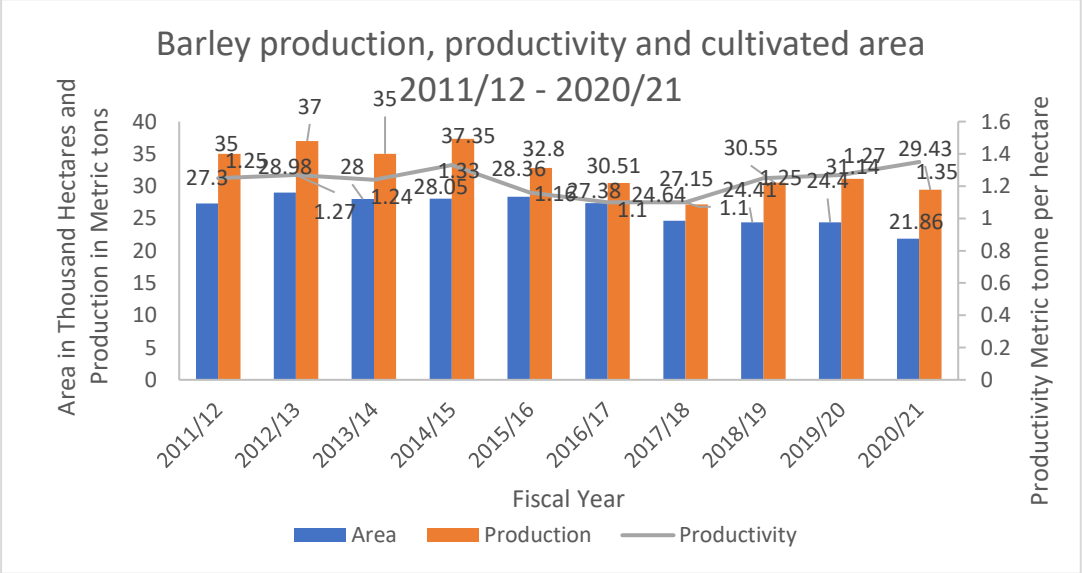


Figure 4.17 Information on Barley Production from 2011/12 to 2020/21

Globally barley is mostly used for three things: producing alcohol, feeding livestock, and producing foods for humans. There is a vast variety of variability in all of these uses, which reflects the crop's broad range of variations and adaptations. It is also evident that selection, whether by biological evaluation or intentional reproduction, has over many generations represented both the use of the product and the climate in which it is farmed. In the past, the innate biodiversity of the crop has given rise to a variety of

uses for it (Newton et al., 2011). So, barley is also known as the most multi-useable crop in the world because of its multiple uses.

Even though the majority of barley varieties grow well, breeding issues are quite difficult. Although it is simple to find malting quality in irrigated areas, the demand for feed is often higher than the need for malting because feed is so expensive there (Harlan & Martini, 1936). Even though barley is a multipurpose crop but there is no more use for barley in Nepal. Barley is only used occasionally so Nepal has not had a good amount of barley production and to fulfill the demand for barley in Nepal the government has to import and sell. The executive body of the Nepal government has to take corrective action and policy formulation for the development and production of barley in Nepal.

The trendline of barley for 40 years has been analyzed and the trend has been divided into two parts first 20 years and then the next 20 years. In 1981/82 on a total of 27 thousand hectares of cultivated land, total barley was produced 23 thousand metric tons which is equal to the productivity of 0.85 metric tons per hectare. This means in the one-hectare scale of cultivated land there is a production of 0.85 metric tons of barley. After 20 years from 1981/82 that is 2000/2001, the cultivated area has increased by 1 thousand hectares and reached 28 thousand hectares and at the same time, the production is also increased and reached 31 thousand metric tons not only area and production has increased besides that the productivity has also increased during the 20 years and reached to 1.08 metric tons per hectare which are because of modern technology and technical and experienced person at that field.

And after analyzing the recent 20 years of data the cultivated area has decreased by 6.14 thousand hectares and reached 21.86 thousand hectares on the other hand production side has also decreased compared to the last 20 years and reached 29.43 thousand metric tons. But compared to the productivity of 40 years and the productivity has reached 1.35 metric tons per hectare which is the highest productivity of barley production in Nepal. Nepal's government is also providing support to the barley-growing farmers from different sectors besides that new modern technology, innovation, research, and development also plays important role in growing barley

production in Nepal. But still, we are not able to fulfill the total demand of the nation which tend to increase in import because of the increasing population in Nepal.

4.5 Millet

4.5.1 Millet production in Nepal

Millets are a staple food for people in semi-arid parts of Asia as well as Africa and have been grown there for ages. The two main millets grown on a significant scale in India today are sorghum and pearl millet, which have global commercial consequences. Finger millet is one of the most widely planted millets in Nepal and a crucial staple crop in the hill and mountain farming systems, particularly in the rainfed and marginal agricultural zones (Ragupathy et al., 2016). In Nepal millet is known as Kodo. Millet is also beneficial for health. It helps to prevent Diabetes and to maintain weight. In the hillside of Nepal, most people eat millet as their primary food because of poverty and unable to grow paddy and wheat in that area.

A recent study on millet in Pokhara has revealed that finger millet is an essential component of farming systems and a substantial source of income for those who reside in the peri-urban areas of the Pokhara valley in Nepal. Because of the high rainfall intensity in the Kagbeni area, it is better to grow finger millet there than in the Begnas area. Bullock's work, however, might substantially replace the need for human labor, thereby lowering cultivation costs and rising profits (K. Adhikari, 2012). Millet is also known as a profitable crop in Nepal. There is good income from millet compared to paddy maize and wheat.

In a nation like Nepal, where 25% of people live on less than USD 1.25 per day and in which indicators of human development and food security, such as average lifespan, mortality rates, underweight child, abortion rates, and literacy rates are depressing in comparison to other developing nations, finger millet plays a more important role as a cheap source of essential nutrients (Njuki et al., 2016). The laborious and time-consuming agronomic procedures and post-harvest procedures of finger millet cultivation, however, are making farmers gradually lose interest in it.

Table 4.5 Descriptive statistical analysis of Millet production in Nepal

		Cultivated Area	**Production**	**Productivity**
N	Valid	40	40	40
	Missing	0	0	0
Mean		238.17	262.07	1.09
Std. Error of Mean		6.83	9.28	.0136
Median		260.00	285.00	1.1050
Mode		196.0a	283.00	1.09
Std. Deviation		43.20	58.69	.086
Variance		1866.662	3444.864	.007
Skewness		-1.496	-1.300	-.798
Std. Error of Skewness		.374	.374	.374
Kurtosis		1.357	.639	.068
Std. Error of Kurtosis		.733	.733	.733
Range		156.00	211.44	.32
Minimum		122.00	115.00	.91
Maximum		278.00	326.44	1.23
Sum		9527.15	10483.19	43.61

The analysis of the forty years of data shows that the mean production of millet is 262.07 thousand metric tons and the production was range from 115 to 326 thousand metric tons which is equal to the productivity of 0.91 to 1.23 metric tons per hectare. The skewness of the production side is -1.300 which seems that data is highly skewed and there is a continuous increment in the production of millet each year but the increment of productivity is very slow. The mode of production is 283 metric tons per year which are also known as the most occurred value in the data which represents that at the time of 40 years production which is lower than the average mean has frequently occurred.

The standard deviation is 58.69 representing that the production of millet has deviated by 58.69 from the average production in Nepal. The range of millet production is a 211.44-thousand-hectare scale which represents the difference between the highest and lowest production. This indicates that there is a high fluctuation in millet production as compared with paddy, wheat, barley, and maize production in Nepal. The total Millet production from 1981/82 to till 2020/21 is 10483.19 thousand metric tons by using the land of 9527.15-thousand-hectare scale with the ratio of 1.09 thousand metric tons per hectare scale.

The analysis of the forty years of data shows that the mean cultivated area used for the production of millet is a 238.17-thousand-hectare scale. The minimum use of cultivated land is 122 thousand hectares scale and the maximum use of cultivated land is a 278 thousand-hectare scale. The skewness of the cultivated land is -1.496 which is highly skewed data.

The mode of using cultivated land is a 196-thousand-hectare scale which is also known as the most occurred value in the data which represents that at the time of 40 years, the cultivated land for the production of millet has not been satisfactorily used. The standard deviation is 43.20 which represents that the cultivated land has deviated by a 43.20-thousand-hectare scale from the average used cultivated land. The maximum productivity of millet is 1.23 in one year which indicates that Nepal will be able to increase the productivity of millet more than the highest productivity. Comparing the productivity of maize, paddy, wheat, barley, and millet it seems that millet has the lowest productivity among the five crops.

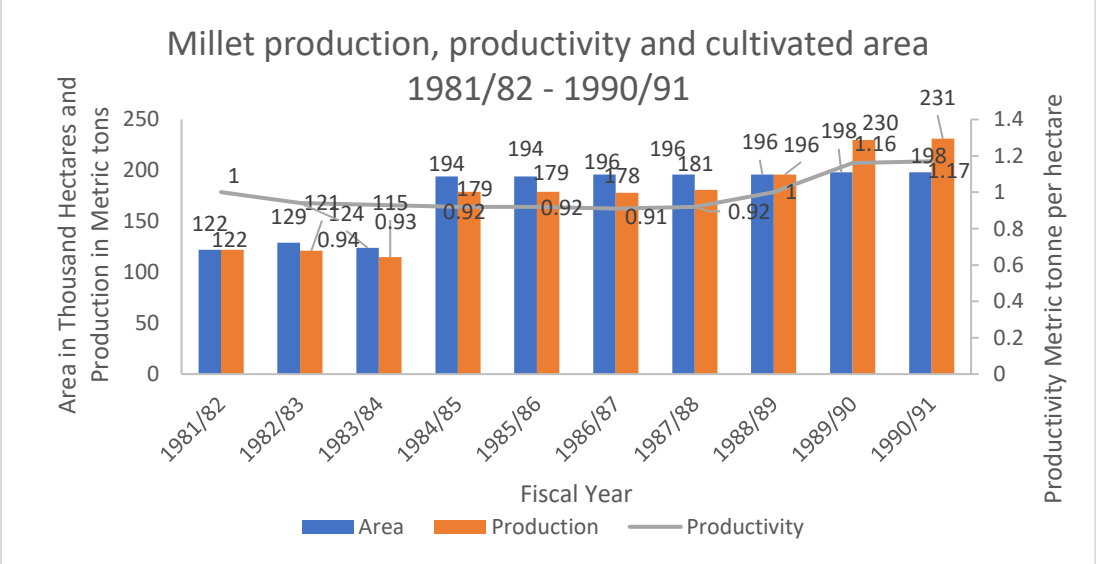


Figure 4.18 Information on Millet Production from 1981/82 to 1990/91

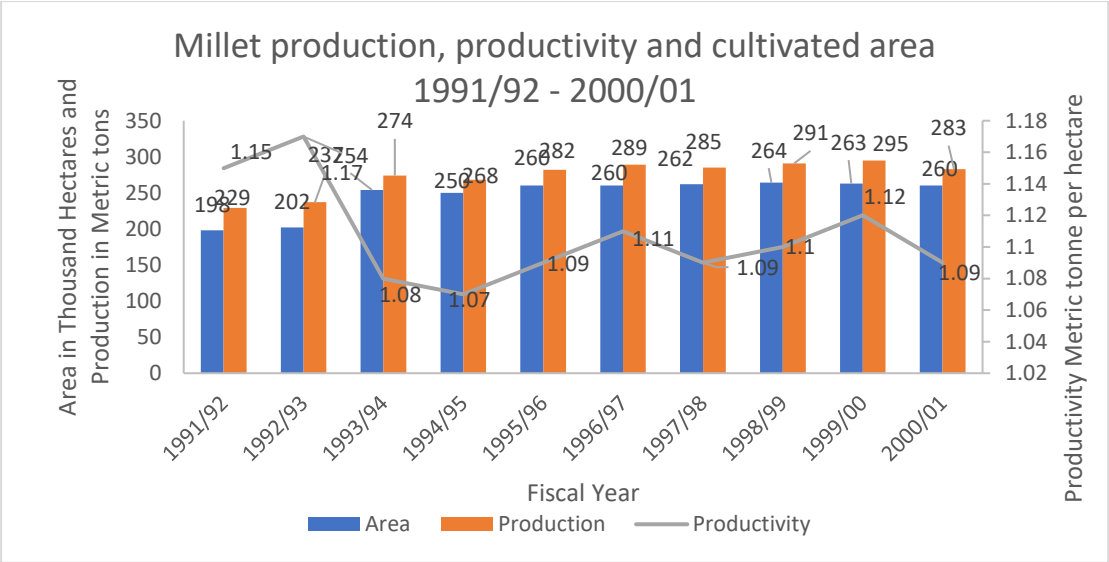


Figure 4.19 Information on Millet Production from 1991/92 to 2000/01

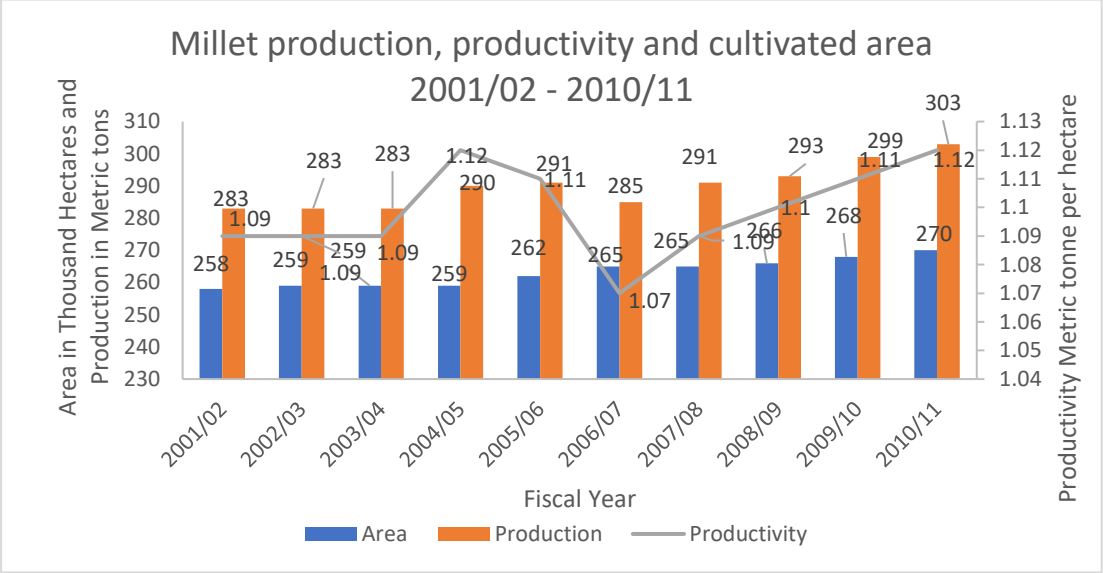


Figure 4.20 Information on Millet Production from 2001/02 to 2010/11

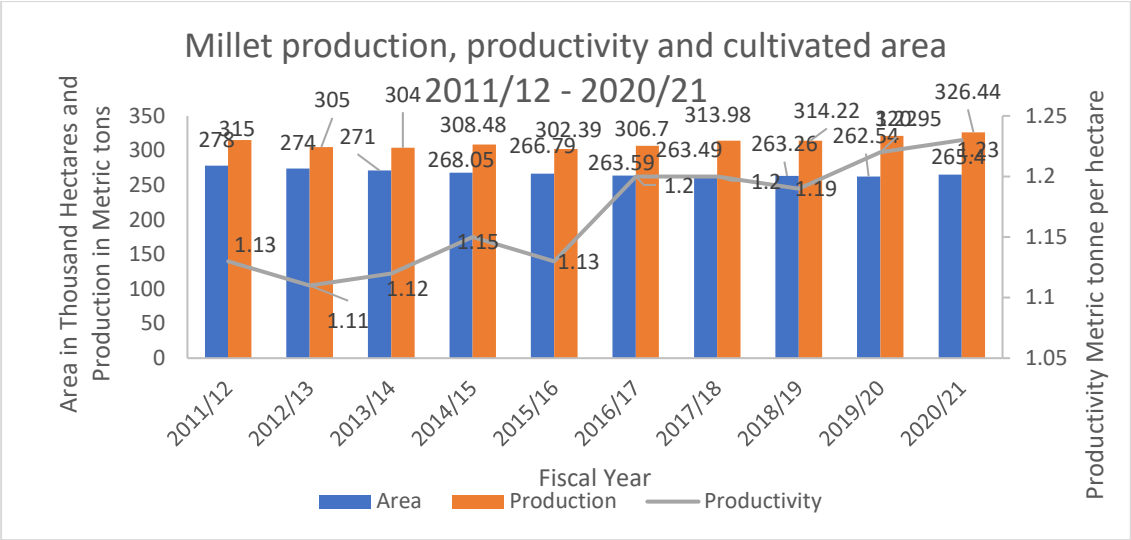


Figure 4.21 Information on Millet Production from 2011/12 to 2020/21

Millions of small-scale and traditional farmers in sub-Saharan Africa have millet as part of their ecological history, and it is essential to their farming practices, food shortages, way of life, and sense of cultural identity. At the global and national level, it is, however, frequently disregarded and undervalued, notably in the case of West African millets. To launch ethnoecological growth modes in remote communities across Sub-Saharan Africa, adequate assistance from science, agricultural projects, and rural development strategies is critically needed (Gar et al., 2016). In Africa millet crop is also known as the "lost crop of Africa" in that it is an export crop (Makun & Ojochenemi, 2014).

The trendline of millet for 40 years has been analyzed and the trend has been divided into two parts first 20 years and then the next 20 years. In 1981/82 on a total of 122 thousand hectares of cultivated land, total millet was produced by 122 thousand metric tons which are equal to the productivity of 1.00 metric tons per hectare. This means in the one-hectare scale of cultivated land there is a production of 1 metric ton of millet. After 20 years from 1981/82 that is 2000/2001, the cultivated area has increased by 138 thousand hectares and reached 260 thousand hectares and at the same time, the production is also increased and reached 283 thousand metric tons not only area and production have increased besides that the productivity has also increased during the 20 years and reached to 1.09 metric tons per hectare which are because of modern technology and technical and experienced person at that field.

And after analyzing the recent 20 years of data the cultivated area has increased by 2.40 thousand hectares and reached 265.40 thousand hectares on the other hand production side has also increased compared to the last 20 years and reached 326.44 thousand metric tons. But compared to the productivity of 40 years and the productivity has reached 1.23 metric tons per hectare which is the highest productivity of millet production in Nepal. Nepal's government is also providing support to the millet-growing farmers from different sectors besides that new modern technology, innovation, research, and development also plays important role in growing millet production in Nepal. But still, we are not able to fulfill the total demand of the nation which tend to increase in import because of the increasing population in Nepal.

4.6 Total Food production

4.6.1 Food production in Nepal

Nepal is not self-dependent on the main five crops. Still, Nepal has to import a million amounts of cereal food to fulfill the demand of the country which supports an increase in the trade deficit each year. Nepal Rastra Bank has declared that under the food segment, it is categorized into five foods they are Paddy, Maize, Barley, Maize, and Wheat. The increment in population and decrease in production create a great problem in increasing the trade deficit. To reduce this Nepal has to improve the productivity of agricultural food sectors. The trend of total agricultural food products production, productivity, and cultivated area for forty years is represented as:

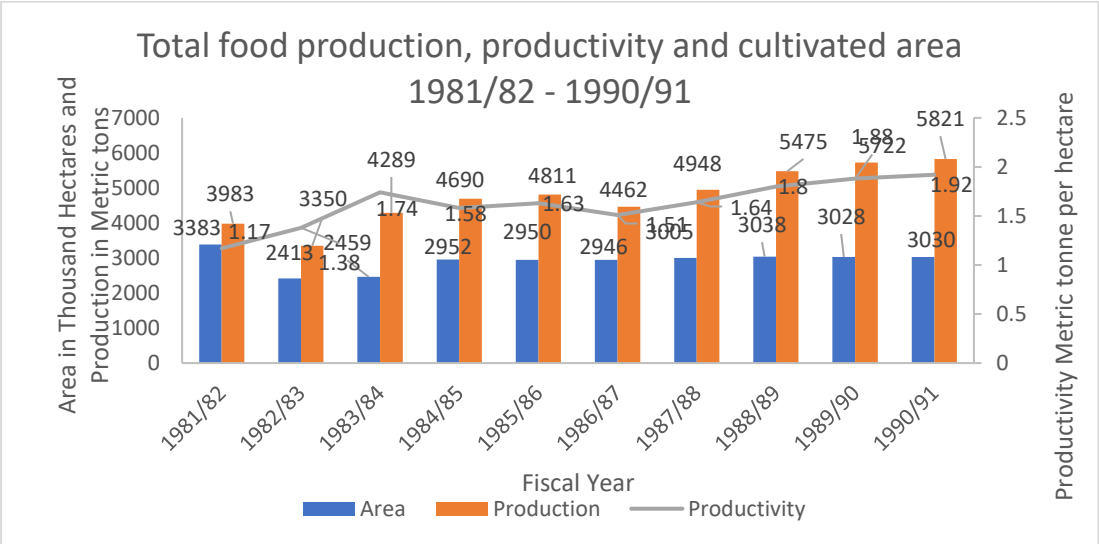


Figure 4.22 Information on Total Agricultural food Production from 1981/82 to 1990/91

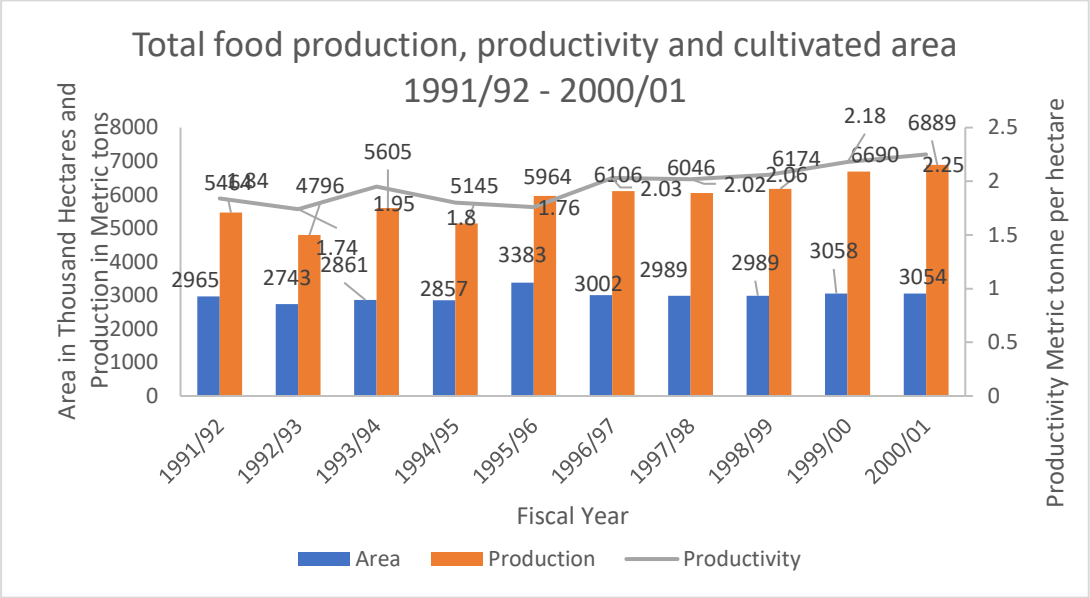


Figure 4.23 Information on Total Agricultural food Production from 1991/92 to 2000/01

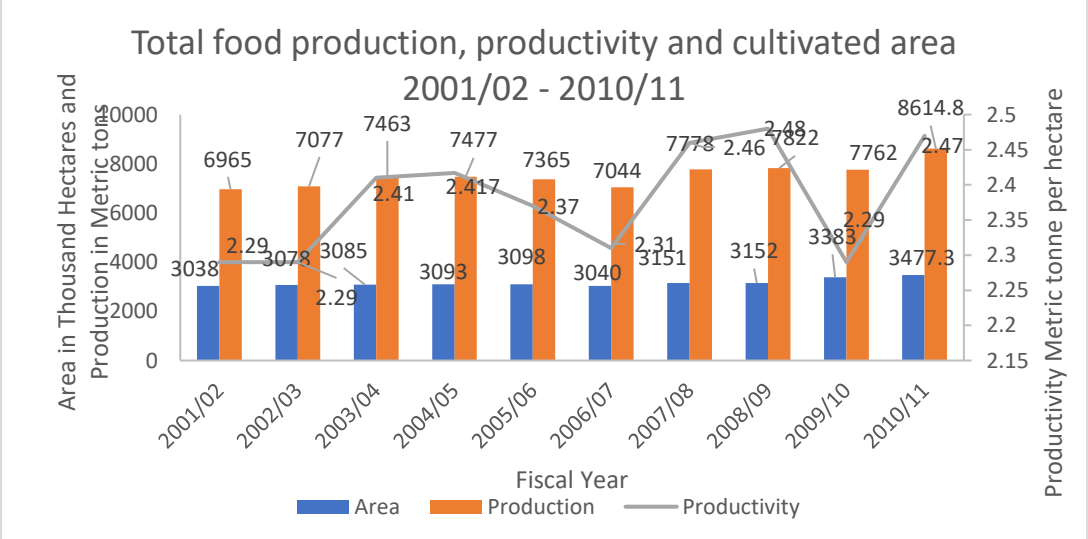


Figure 4.24 Information on Total agricultural food Production from 2001/02 to 2010/11

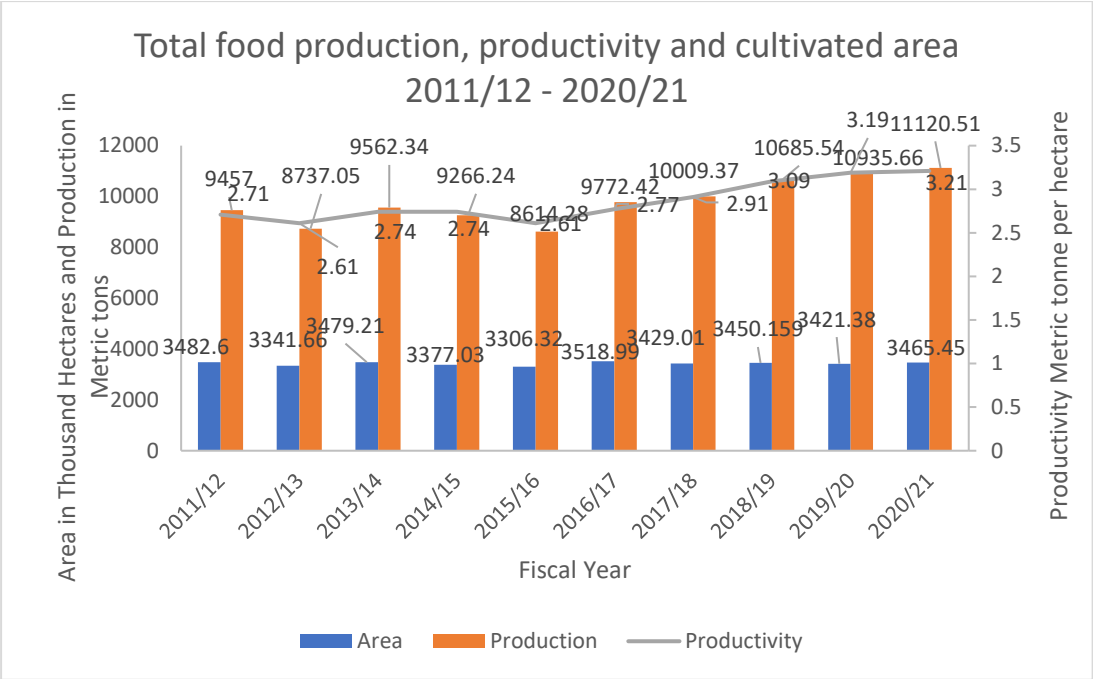


Figure 4.25 Information of Total agricultural food Production 2011/12 to 2020/21

The graph is of total food production, productivity, and total cultivated area for rice production in Nepal for the last forty years starting from 1981/82. Under food production, only five foods are considered as food as indicated by the authorized body of Nepal which is known as Nepal Rastra Bank which are Paddy Maize, Barley, Millet, and Wheat. Nepal is not self-dependent on these all foods. Each year we import these from different countries for the fulfillment of local demands. If Nepal will not import this food there is a huge chance of food hunger and which ultimately impacted the gross domestic product and ultimately hit hard on the per capita income of Nepalese people and the overall financial condition of Nepal. To reduce these problems in the future and decrease the dependency on imports there is a need for local production. Without an increment of production in Nepal, there is no alternative to import for the fulfillment of hunger in Nepal.

By analyzing the production productivity and cultivated area of the main total five crops in Nepal starting from 1981/82 to 2020/21 we have found that beginning of the year 1981/82 in total 3383 thousand hectares of cultivated area in Nepal successfully grown 3983 thousand metric tons of products which are calculating on the ratio of 1.18 metric ton per hectare of productivity. That means an average of 1.18 metric tons of production

on one hectare of cultivated area. Because of the traditional production system, productivity has not increased at a good pace.

After 10 years 1981/82 that is 1990/91 the cultivated land decreased by 353 on the -thousand-hectare scale and reached 3030-thousand-hectare scale but in 10 years, the production increased by 1838 thousand metric tons and reached 1 thousand metric tons in that year. Which is equal to the productivity of 1.92 thousand metric tons per hectare which is a good increment in the production sector of crops in Nepal. But after 10 years in 2000/2001 with the increment of 28 thousand hectares of cultivated land, the production increased by 1068 thousand metric tons and reached 6889 thousand metric tons from this, we can analyze that the productivity of 2.26 thousand metric tons per hectare which is increased in increasing trend.

The increasing trend has increased and reached 3.21 thousand metric tons per hectare in 2020/21 which is a good increment in the productivity of cereal crops in Nepal. The success story of increasing productivity in advanced technology, skilled manpower, and the government initiations for the increment in agricultural products in Nepal. Besides that, the Nepal government is providing marginal interest loans to needy people and providing necessary training to the concerned people for the development of productivity in Nepal.

The Statistical analysis of the total production has been presented as:

Table 4.6 Descriptive statistical analysis of total agricultural food production in Nepal

		Cultivated Area	**Production**	**Productivity**
N	Valid	40	40	40
	Missing	0	0	0
Mean		3124.42	6996.32	2.21
Std. Error of Mean		42.069	323.1	.079
Median		3068.00	6927.00	2.27
Mode		3383.00	9457.00	1.17
Std. Deviation		266.07	2042.87	.51
Variance		70794.339	4173338.718	.250
Skewness		-.530	.349	.136
Std. Error of Skewness		.374	.374	.374
Kurtosis		.473	-.736	-.561

Std. Error of Kurtosis	.733	.733	.733
Range	1105.99	7770.51	2.031
Minimum	2413.00	3350.00	1.17
Maximum	3518.99	11120.51	3.2089
Sum	124976.91	279852.89	88.42

Nepal is facing a trade loss each year because there is not much production in Nepal as compared to their population and the demand of the nation so, the country is compelled to import the necessary products to fulfill the demand. So, the current need of Nepal is to reduce the import by using maximum utilization of available resources for production. Production is one of the most important parameters for the development and increase in the export side of the counter and which also helps to reduce the trade loss of the nation. The analysis of the forty years of data shows that the mean production of agricultural food products in Nepal is 6996.32 thousand metric tons per hectare. where the production was range from 3350 to 11120.51 thousand metric tons which is equal to the productivity of 1.17 to 3.2089 metric tons per hectare. This clears that there are huge fluctuations in paddy production in Nepal. The skewness of the production side is .374 which seems that data is positively skewed and there is a continuous increment of production of agricultural food production in Nepal each year. The mode of production is 9457 metric tons per year which is also known as the most occurred production which represents that at the time of 40 years, the production rate has higher than the mean production in 40 years.

The standard deviation of 933 represents that the data has deviated by 933 from the average production. The range of products is a 3788-thousand-hectare scale which represents the difference between the highest and lowest production. This indicates that there is a huge difference from highest to lowest production. Where the minimum is 1833 thousand metric tons per hectare and the maximum is 5621 thousand metric tons in a year. The total paddy production from 1981/82 to till 2020/21 is 156927.58 thousand metric tons by using the land of 58629.34-thousand-hectare scale with the ratio of 2.67 thousand metric tons per hectare scale.

The cultivated land played important role in producing agricultural food products in Nepal. The cultivated land of Nepal is limited and the government has to formulate a

different program the increment productivity in the limited area. Producing more products in the limited area by the maximum utilization of the available resources is the main theme for the increment of productivity in Nepal. The analysis of the forty years of data shows that the mean cultivated area used for production is 3124.42 thousand-hectare scale. The minimum use of cultivated land is 2413 thousand hectares scale and the maximum use of cultivated land is 3518.99-thousand-hectare scale. The skewness of the cultivated land is 0.374 which is symmetric data.

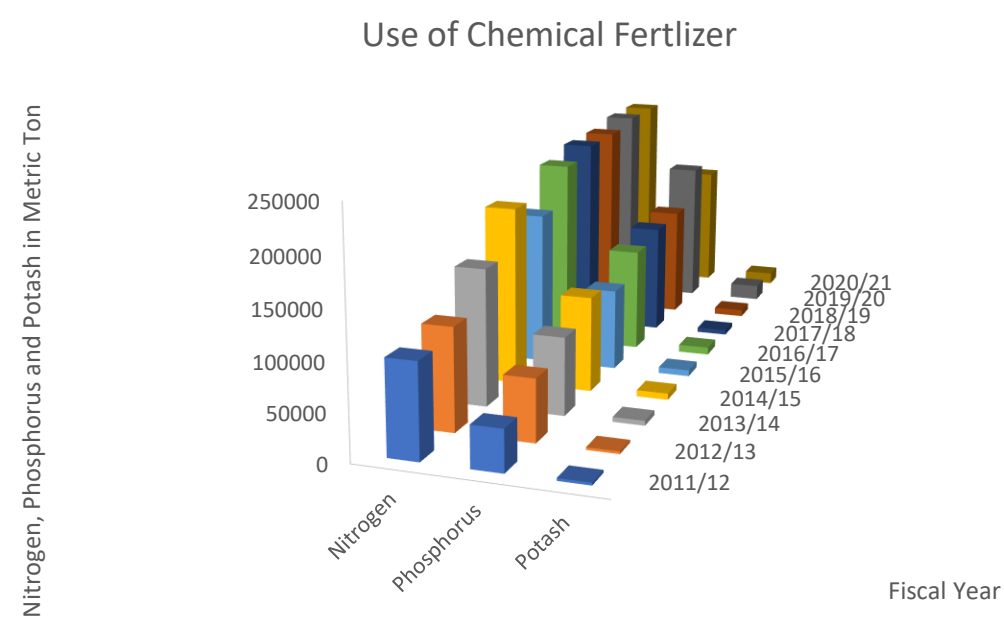
The mode of using cultivated land is a 3383-thousand-hectare scale which is also known as the most occurred value in the data which represents that at the time of 40 years the cultivated land for the production of agricultural food production in Nepal the most occurred and used the land for the production of agricultural food production in Nepal. The standard deviation is 266.07 which represents that the cultivated land has deviated by a 266.07-thousand-hectare scale from the average cultivated land. The maximum productivity of agricultural food products is 3.2089 in one year which indicates that Nepal will be able to increase the productivity of agricultural food products more than the highest productivity.

4.7 Use of chemical fertilizer

Fertilizer use, in particular, has been successfully connected to rising agricultural output, particularly in emerging nations. According to researchers, there is a significant correlation between fertilizer use as well as crop productivity, enabling farmers to make significant profits. According to recent research, ineffective deployment of a based-on-technology acceptance subsidy results in a significant reduction in the consumption of chemical fertilizer, as well as government-led subsidy schemes that neglect to address institutional factors like the availability of land certificates hurts agricultural efficiency in developing countries (Gardebroek, C.1 and Hernandez, n.d.). So, we can say that the fertilizer adds to the productivity of the crops in Nepal.

As in the year 2011/12 99196 metric tons of Nitrogen, 43724 metric tons of phosphorus, and 2733 metric tons of Potash has been used and that year 9457 thousand metric tons, and at that time total productivity was 2.71 thousand metric tons per hectare but after 10 years of data as on 2020/21, the all chemical fertilizer has increased and reached to

223358.85 metric tons Nitrogen, 140166.63 metric tons of phosphorus and 13097.2 metric tons of potash has been used and another hand both production and productivity has increased and reached to 11120.51 thousand metric tons of production and 3.21 thousand metric tons per hectare of productivity which shows that increment in fertilizer leads to increment on the production and productivity of the land. Besides that, there are a lot of disadvantages to using chemical fertilizers. For the increment of production, there is a trend to use chemical and organic fertilizers. The 10 years of data for the use of chemical fertilizer has shown in the graph.



	Nitrogen	Phosphorus	Potash
2011/12	99196	43724	2733
2012/13	108553	65722	2688
2013/14	145632	82520	5046
2014/15	190163	101797	6717
2015/16	164803.8	87532.25	6577.85
2016/17	205281.2	111708.4	7987.8
2017/18	214979.6	120009.05	5156.3
2018/19	215733.4	122116.4	7377.2
2019/20	222835.03	160756.5	16949.5
2020/21	223358.85	140166.63	13097.2

Figure 4.26 Use of Chemical Fertilizer

For the development of agricultural products, there is a need for fertilizer. Fertilizer is mainly classified into two types, organic and inorganic fertilizers. Both fertilizers have their own positive and negative parts. The fertilizer which is usually made by the use of plant and animal waste is simply known as organic fertilizer. Organic fertilizer is also known as sustainable and environmentally friendly fertilizer it helps to reduce the need for pesticides and overall requirements of nitrogen, phosphorus, and potassium.

4.8 Relation Between Production, Fertilizer Used, and Cultivated Area

Table 4.7 Correlation between Production, Fertilizer Used, Cultivated area, and Yearly mean temperature

Descriptive Statistics			
	Mean	Std. Deviation	N
Production	6996.32	2042.87	40
Fertilizer Used	104580.54	92233.720	40
Cultivated Area	3124.42	266.07	40
Yearly Mean Temperature	14.0615	.35138	40

Correlations					
		Production	Fertilizer Used	Cultivated Area	Yearly Mean Temperature
Production	Pearson Correlation	1			
	Sig. (2-tailed)				
Fertilizer Used	Pearson Correlation	.742**	1		
	Sig. (2-tailed)	.000			
Cultivated Area	Pearson Correlation	.806**	.583**	1	
	Sig. (2-tailed)	.000	.000		
Yearly Mean Temperature	Pearson Correlation	.779**	.225	.594**	1
	Sig. (2-tailed)	.000	.162	.000	
**. Correlation is significant at the 0.01 level (2-tailed).					

4.8.1 The Problem

Investigate the relationship between production and fertilizer used

H1: There is a significant relationship between the production and fertilizer used

4.8.2 Reporting Pearson Correlation

Pearson product correlation of production and fertilizer was found to be highly positive and statistically significant ($r = .742$, $p < .001$). Hence H1 was supported. This shows that an increase in the use of fertilizer has increased the production of agricultural food products in Nepal.

4.8.3 The Problem

Investigate the relationship between production and Cultivated Area

H1: There is a significant relationship between the production and Cultivated Area

4.8.4 Reporting Pearson Correlation

Pearson product correlation of production and the cultivated area was found to be highly positive and statistically significant ($r = .806$, $p < .001$). Hence H1 was supported. This shows that an increase in the cultivated area for production has increased the production of agricultural food products in Nepal.

4.8.5 The Problem

Investigate the relationship between production and Yearly mean temperature

H1: There is a significant relationship between the production and Yearly mean temperature

4.8.6 Reporting Pearson Correlation

Pearson product correlation of production and yearly mean temperature was found to be highly positive and statistically significant ($r = .779$, $p < .001$). Hence H1 was supported. This shows that an increase in the yearly mean temperature has increased the production of agricultural food products in Nepal.

The combined result shows that there is a positive correlation between production with cultivated land fertilizer used and the yearly mean temperature. It says that there is a need for those factors for the increment in the agricultural food products in Nepal.

4.9 Agriculture Import Practice in China

China has long been regarded as having a workforce benefit in agricultural output and international competitiveness in cheap labor and agricultural commodities because it is the biggest nation and has a sizable proportion of its population living in rural areas (Gardebroek, C.1 and Hernandez, n.d.). China's export markets have gradually expanded in both size and scope as a result of agriculture commercialization, giving it the chance to fully utilize both local and international marketplaces and resources, in addition to taking advantage of opportunities presented by the force and difficulties of the global market.

According to the predicted grain economic growth, relative pricing, domestic production, and per-average earnings all played a role in determining the import of crops, primarily wheat. Long-term wheat importing growth would primarily be driven by rising income. However, it is revealed that revenue and related pricing, and related output have a minor impact on the economic growth of sugar (Supply & Demand, 1994). In addition, local production has largely satisfied China's financial need for rice, vegetables, pig meat, and chicken meat, with trade filling in the rest. But it is anticipated that imports will account for a sizable share of China's utilization of dairy products, oilseeds, and meat from sheep, goats, and sheep.

Due to this era's comparatively rapid population and economic growth, the majority of the increase in imports of these products is anticipated to take place from 2009 to 2030 (Gardebroek, C.1 and Hernandez, n.d.). Furthermore, agriculture is regarded as being one of China's most important key sectors to supply national food requirements. China's primary sector is important agricultural goods increased throughout time, even though its contribution to the economy and overall employment decreased.

China is a country that has a great portion of the world's economy and exports its products to the world but still some countries like Canada, the United States, Australia, and the European Union are the grain exporters to China (Wang & Ke, 2005). For Nepal, China is the second highest exporter country in terms of volume after India. The Nepali economy has to import most of its garments from China. The conflict between the needs and supplies of maize, soybeans, vegetable oil, and sugarcane will worsen

under the burden of expanding tighter regulations on both the ecosystem and resources. The requirements for soybeans and maize imports to China will increase, particularly given the rise in agricultural and livestock feed requirements (Xu et al., 2015).

In China, even though foreign-made foodstuffs must adhere to the same safe operation requirements as locally produced fruits and vegetables, international business regulations allow a foreign state to use its own, unique regulatory bodies and institutional system to comply with such standards. This is done under the globally recognized theory of "equivalence" (Becker & Ave, 2007). The impact of China's retaliatory tariffs has ramifications for the US agricultural production that reduce welfare.

Long-term reductions in national output amounting to about $6.8 billion lead to a drop in wages and salaries and jobs associated with agriculture (Elobeid et al., 2021). China pledged to import more goods again from the United States in 2020 and 2021 as part of a phase one deal that China and the United States signed in December 2019. Even though the 2019-2021 coronavirus outbreak and the appointment of President Biden may make this contract irrelevant or at the very least slow down its execution, it is still important to consider whether it might have been accomplished (Feenstra & Hong, 2022).

4.10 Agriculture Import Practice in India

India which is the neighboring country of Nepal. The majority of imports in Nepal have come from India and Nepal is dependent on many products from India. In today's world, most of the countries which have huge trade losses and want to reduce imports are using an import substitution strategy to reduce imports. According to Japan's and some other nations' experiences, one of the best successful methods of reducing imports is the consumption and production of import-substituting products based on the license provided by the government (Zobov et al., 2017). Over the decades, Indian agrarian products have gained dominance in the international market.

India is a significant exporter of pure fruits, healthy vegetables, meat, and its dishes, grains, spices, cashews, oil meals, tea, coffee, and grains to the global market. It also exports marine items. But the nation is up against stiff opposition from other powerful

competitors, both long-standing contenders, and recent entrants (Gardebroek, C.1 and Hernandez, n.d.). In India over the decades from 2000-2019, the volume of exports has exceeded that of imports. International trade has a positive impact and the balance of payment is in surplus (Bhatia, 2021). To put it another way, the positive in the agricultural balance of payments during the period under consideration.

In many mountainous regions of India, cash crops have been frosted by policies that guarantee property rights in forested areas, shield farmers, from market exploitation, provide modern inputs at a discount price, and forbid the import of agricultural products (Semwal et al., 2004). The Indian business is confusing. According to the argument, India before the trade agreement was marked by pervasive restrictive measures, high import taxes, and limitations on export and international financing, protecting the home market by constraining possibilities for using new technology and learning through experience and promoting underproductive and inadequate domestic companies by helping to protect the home market (Storm, 2003).

Production is required to boost export while decreasing imports. From the production perspective, significant investments in cutting-edge technology or the use of smart farming, along with environmentally friendly techniques and improved resource allocation, can reduce the rise adverse consequences of agricultural business in the long run (Balogh & Jámbor, 2020). Besides new technology, there is a need for research and development along with motivating the stakeholder for the development of agricultural production. Another problem in India's trade with foreign countries is the true issues in the supply chain are revealed by investigating the trends and the patterns of sale rejection instances of Indian commodities, as well as the cause of lost possibilities for foreign trade. Typically, the number of exported goods from India throughout the period was inversely proportional to the structure of shipment refusals (Geetha et al., 2020).

4.11 Agricultural trade relations of Nepal with China and India

Nepal is a landlocked nation. It is situated between the two powerful economies of China and India. Whereas Nepal's Southern (mainly plain), eastern, and western borders are joined with India, it's mostly the mountains' northern boundary with China.

Even though Nepal began diplomatic relations with China and India on August 1, 1955, and June 13, 1947, respectively (Dahal, 2018). Nepal has a very good trade relationship with both the neighboring countries China and India. Nepal has imported most of its agricultural products from India and China, mostly garment products have been imported.

The very first commerce and transit agreement between Nepal and India, its main trading partner, was struck in 1950. Since then, the agreement has been repeatedly renewed, and then in march 2007, the two countries linked for a mutual trade agreement. Nepal switched from a more inward approach to an outward-looking methodology after implementing a liberalization approach in the middle of the 1980s and opening its border to foreign trade. Nepal has signed numerous bilateral, national, and global trade agreements because of its fee economic strategy (Acharya, 2013).

Besides a good trade agreement with India, there are serious issues that are currently affecting both India and Nepal one of the hot issues is the border issue. Regarding cross-border corporations, the open immigration approach has produced a lot of great deals of issues and has had an impact on both India's and Nepal's social and economic environments. The unfettered mobility of terrorists and the cross-border flow of illicit ammunition and firearms currently rank among the most critical issues. All these nations will suffer greatly from this (T. N. Baral, 2018). An unregulated and uncontrolled, and free movement of people serves as a haven for terrorist attacks, crime, and other unlawful and negative acts.

While its 1956 "Contract to established mutual relationship" between Nepal and China allowed for the free passage of small traders across borders, the 1966 " Memorandum of Understanding of Trading, Intercourse and similar issues" required that these traders registered there at border crossing posts (Press, 2018). Similarly, to this commercial and merchant houses who'd already proposed this business increasingly left the northeastern border areas to look for work elsewhere in Nepal.

There exists an immediate need to govern and supervise the freedom of movement of individuals with an eye toward the well-being and growth of both countries' general populations. But on the Nepal-China boundary, however, there isn't any such conflict

between the border's residents on either side. Nepal will have every opportunity to take as much as possible from China as well as India's economy, which is also recognized as the world's biggest economy on the world. The majority of Nepal is encircled by India, and also the two countries share the same language, society, customs, religion, etc. However, Nepal's trading two-way business transactions with nations outside of China and India are currently improving. But India is counted to be one of Nepal's main trading partners (S. Sharma, 2020).

The lower-income people, mainly the rural landowner's workers, and smaller farmers suffer a disproportionately large amount of the expenses of modernizing Indian foreign trade in farm commodities. These costs are largely and poorly represented (Storm, 2003). Overall it can be argued that the producers of importing textiles from India and exporting vegetable ghee to China are better than the benchmarks set by the doing business initiative, but the process for exporting vegetable ghee into India is even worse (Working & Series, 2010).

It is extremely difficult for Nepal to maintain good ties with both India and China given the obstacles posed by its two neighbors. Both nations have adopted different political, social, and trade ideologies. India has been selected for the legislative form of governance, while China has a communist structure. Despite being governed by the communist party, Nepal possesses a dramatic system of government. Nepal's contribution is noteworthy in this context. However, there is a widespread belief in other parts of the world that Nepal's principal foreign policy problem is to strike a balance in its relations with its two enormous neighbors, China and India (B. N. Baral, n.d.). So, Nepal may play a key role in making good relations with China and India.

4.12 Agriculture Production Vs Economic Growth in Nepal

Agriculture must be a part of global economic growth, poverty reduction, and environmental sustainability because the majority of the poor live in rural regions and rely on agriculture for their livelihood. In terms of its percentage of the gross domestic product nearly always in terms of the number of people it employs, agriculture remains the most important productive sector in the majority of low-income nations, which is essential for reaching the global poverty reduction target (Economics & Library, n.d.-

a). The livelihood of every Nepalese person depends heavily on the agriculture sector, which accounts for more than one-third of the country's Gross Domestic Product (GDP) and employs one-third of its labor force so, it is appropriate to give it a great priority. An estimated 2.8 million people, or 10% of the national population, includes vulnerable indigenous communities, and half of the youths between the age of 18 and 35 move abroad nowadays (T. Joshi et al., 2022).

A strong and capable agricultural sector alone is a huge source of raw materials, the creation of jobs, and money for the growth of the non-agricultural sector. Even though massive sums of money have been invested in the agricultural sector and its growth has been given top priority, the productivity of the main crops is still quite low when compared to that of other nations (Upadhyaya, 2019). The main barriers to the development of this industry include its challenging geography, a lack of irrigation infrastructure, dependency on the monsoons, and farming at a traditional and subsistence level. To boost income, reduce poverty and improve the standard of living for Nepalese citizens, the agricultural sector is crucial.

The Nepalese people depend heavily on the agricultural industry, which generates around 36% of the nation's GDP and employs 66% of its workforce (Gauchan & International, 2018). Because agriculture is the foundation of both the rural and national economies of the nation, its development is crucial for economic growth. The majority still rely mostly on the agriculture industry in Nepal as their main source of food, employment, and income (Chaudhary, 2018). So, agricultural production and economic growth are interrelated each other there is a need to develop agricultural production for the development of economic growth in Nepal. Currently, Nepal is facing a huge loss in international trade because of low production.

With an average holding size of 0.8 hectares, smallholders and marginal farms dominate Nepalese agriculture. Less than 0.5 hectares of land make up about half of all farms, while less than 1 ha of land makes up nearly three-fourths of all holdings. The average size of property decreased by 28% between 1961 and 2001, indicating that farms are becoming smaller (Karkee, 2008). Based on the findings of a simple ordinary least squares test, it can be concluded that Nepal's agriculture sector significantly contributes to both economic expansion and social development. The research shows

that agriculture is the foundation of an economy, without which it cannot function or exist, and developing nations must place a high priority on agriculture, especially in the early phase of economic development (Mishra, 2021).

4.13 Productivity of cereal crops in Nepal

The productivity of rice in Nepal is considered as good as compared to last year.

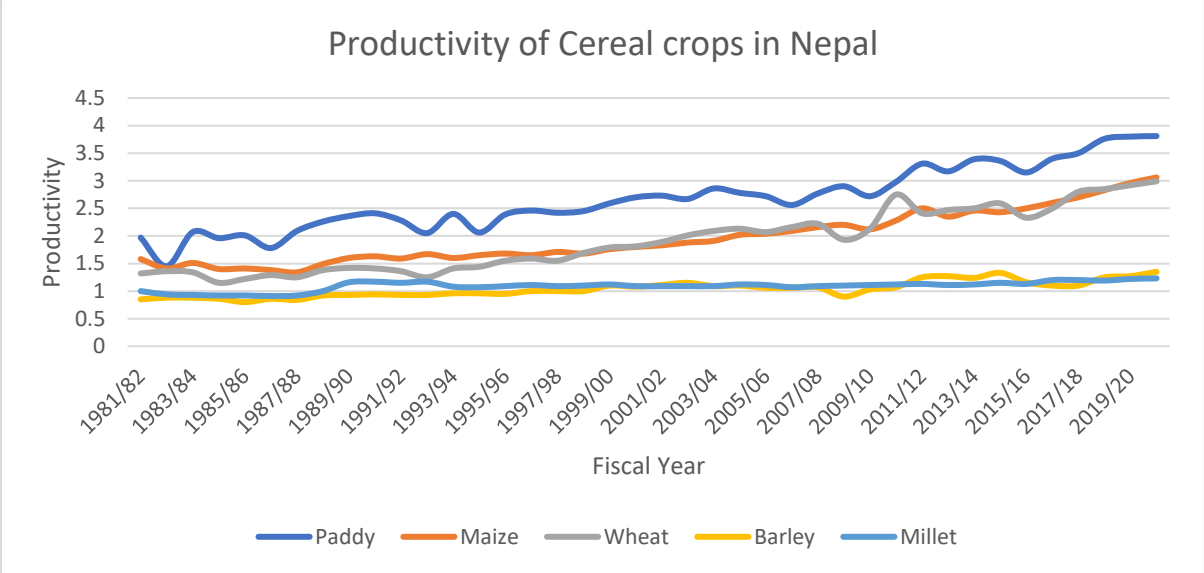


Figure 4.27 Total cereal crops productivity in Nepal

Maintaining and boosting agricultural productivity is the best way to guarantee food security in the current climate change scenario. But because of the speed of climate change, several abiotic elements, including temperature, solar radiation, rainfall, drought, and flooding, are adversely affected rice yield at different growth stages (Hussain et al., 2020). In cereal crops comparing, to other crops rice is the staple food for Nepalese food. It is also considered the most contributing food to the gross domestic product of Nepal and individually rice contributes 20.8% of the agricultural GDP in Nepal (Chandio et al., 2021).

In Nepal rice has made a substantial contribution to rural household levels of food security. The crop is grown extensively in Terai to mountain basins and hillsides, among other agroecological regions. With a total area of 1.49 million hectares, rice cultivation takes up more than 80% of all cultivated lands. The study's findings indicate that adopting measures for coping with climate change could greatly boost rice

production (Khanal et al., 2018). The highest height in the world for rice production is in Jumla where it occurs between 2400 and 3050m above sea level (M. Paudel, 2013). Rice is grown in Nepal at the highest elevation, Chhumjul of Jumla, which has a record elevation of 3050m. Rice farming in Nepal is still largely dependent on rainfall, despite the government's claims that one-third of the land used for cultivation has been put under irrigation (J. Nayava, 2017).

The latest research shows that while paddy production contributes significantly to GNI, it does so differently from imported paddy from other nations. The paddy production and import coefficients were discovered to be β=0.444 and β=0.516, respectively. The beta coefficients of imported paddy appear to be higher than those for domestically grown paddy (Magar, 2020). It indicates that imported paddy has a greater impact on Nepal's economic development than domestically produced products. Paddy imported from abroad is essential to Nepal's economic expansion. It demotivates the local farmers and policymakers to increase the productivity of paddy production in Nepal. Paddy production is just an example there are many other products that the country is enjoying by importing the product which will be a long-term effect on the agricultural productivity in Nepal. Even though the percentage of agricultural production in gross domestic product manages to decline due to government policy bias against food production, it has critical not to neglect the great relevance of domestic agricultural products' contribution to keeping a sufficient rate of economic development (Yao, 2000).

4.14 Sustainable Development and Agriculture

Since the United Nations Environment and Development Conference in Rio de Janeiro (1992), interest in the sustainable development of agriculture has risen significantly. This is due in the accordance with the Brundtland Commission Report (WCED, 1987), it was acknowledged that as a result of the increasingly intense use of natural resources and also the start rising in environmental damage globally, more serious it was recognized that sustainability and environmental protection (Lancker & Nijkamp, 2000). Until the early 1970s, Nepal was a net food exporter but is now a net importer. The ability of Nepal to generate sufficient food has been severely hampered by several problems, including limited land holdings, rocky terrains, remoteness of farmland, poor

access to basic agricultural resources(seed, fertilizers, and irrigation) labor shortages, and farmers' low technical skills (T. Joshi et al., 2022).

Nepal has the lowest per capita energy consumption and is one of the least developed countries in the world with few reserves of coal, natural gas, or oil (Sovacool, 2011). In addition, Nepal a landlocked country is also being hit hard by global warming. Although marine, pollution did not affect the country, the country was severely affected by air and water pollution. The country's ecosystems, which depend on the country's agriculture, are seriously shaken. Climate change has affected the country's gross domestic product by causing an off-season monsoon that affects large-scale industries. Therefore, we must go hand in hand with the environment and development.

While the predicted population of crops is over 5.0 t/ha, the projected national productivity is at 2.0 t/ha, according to the World Development Indicators (WDI). Some complexities have included determining effects of climate change and fluctuations, poor soil fertility, the presence of bugs and diseases, inadequate monetary support and technical assistance, limited utilization of enhanced farming innovations, unexpected environmental conditions, and unsustainable agricultural production procedures, whereas the circumstances have been created worsened by increasing growth rate of population (Ali et al., 2021). By analyzing the productivity of paddy production in Nepal for the last 40 years there is no huge increment in paddy production in Nepal.

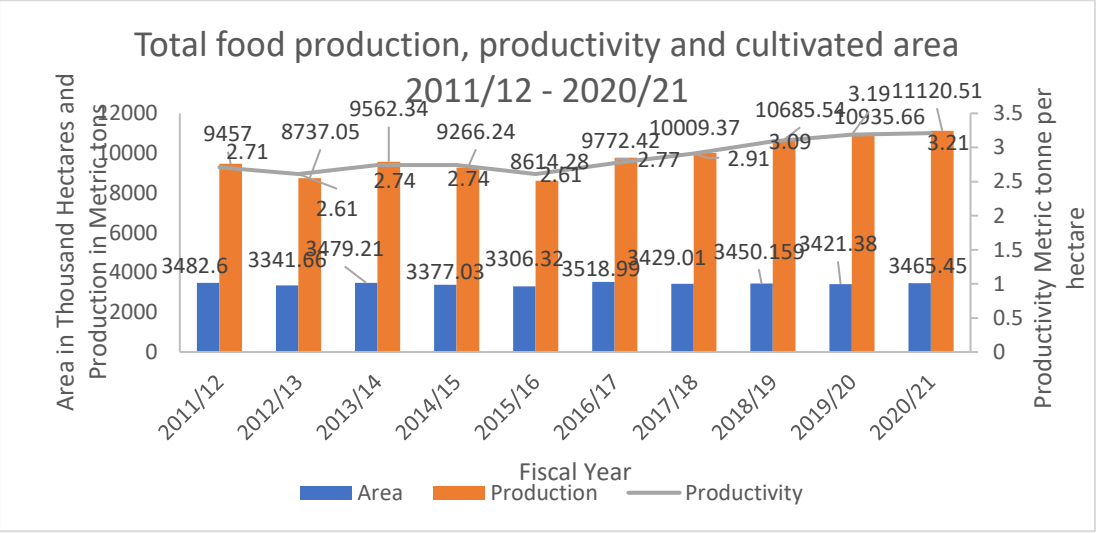


Figure 4.28 Total food production, Productivity, and Cultivated Area from 2011/12 to 2020/21

The graph represents that without increasing the cultivated area in Nepal there is an increment in the production of food products in Nepal. In 2011/12 total cultivated land for production is greater than in 2020/2 but the growth rate increased compared to 2011/12. Besides that, the use of chemical fertilizer is also increasing each year which will indirectly affect the fertile capacity of the cultivated land. According to the literature survey previously indicated, the terai region's sustainable agriculture development benefits hugely from the joint use of surface and groundwater (Bhattarai & Shakya, 2019). The Nepalese government has made it a top priority to connect ecotourism and agribusiness to advance environmental sustainability for many years (Gurung, 1994).

Therefore, a sophisticated and analytical agricultural method is required to meet the rising needs while simultaneously preserving the soil's fertility. Sustainable and responsible approaches, agricultural intensification, generally modified crops that fixed nitrogen without microbial symbionts, using microorganisms or genetically engineered microorganisms to boost plant growth, and the utilization of fertilizer are examples of present sustainable farming strategies (Gouda et al., 2018).

4.15 The relationship between export and Economic Growth

The exchange of money, products, including ideas outside geographical boundaries is simply known as international trade. The continuation of globalization depends on expanding international markets. It is a key source of national income for any country regarded as a world power. It contributes a good proportion of the gross domestic product (GDP) (Parajuli, 2021). In the short term, the export of agricultural products has a favorable and considerable impact on Nepalese economic growth. The previous research shows that there is empirical proof that long-term economic expansion is not the outcome of Nepalese export markets (A. Ghimire et al., 2021).

It is important to change Nepal's International trade pattern and structure because the research demonstrates that agricultural exports there has a long-term negative correlation with GDP development. It's also important to note that by turning its export markets into value-added goods, Nepal can transform the pattern of its agricultural goods. As a consequence, a bidirectional correlation passing from agriculture to

economic growth as well as from growth in the economy to agriculture is found as long-term stable. Another important aspect driving agriculture's enormous rise is economic growth (Jatuporn et al., 2011).

Recent research shows that the theory of export-led over a long term where total GDP is utilized. Unfortunately, there is no proof of a connection between economic growth and export in the short term. Adversely, exports contribute to economic growth in both the short and long term when non-export GDP is taken into account. These results demonstrate that export markets are a key factor that drives economic growth. The report, therefore, urges additional trade policy liberalization to boost exports (KEHO, 2017). Besides, some countries are focusing to accept foreign aid for the development of their country. The research shows that there are very disparities between how foreign aid affects economic expansion in both datasets: its business increases in high-income nations while slowing it down in low-income ones (Woods et al., 2017).

Technical barriers to trade's part in promoting fixed costs should be properly considered in an export promotion strategy that seeks to maximize the number of exporters. This hurts a negative effect on entry/exit decisions as well as participation in exports, with the effects disproportionately affecting smaller businesses (Zamrodah, 2016). In addition, due to technological trade restrictions, agricultural export growth is necessary to take advantage of opportunities presented by regional and international commercial relationships. Diversification of export can be achieved, however by retaining current agricultural practices. Nepal must therefore completely revise its agricultural growth plan regarding product choice on the operational scale (Piya et al., 2010).

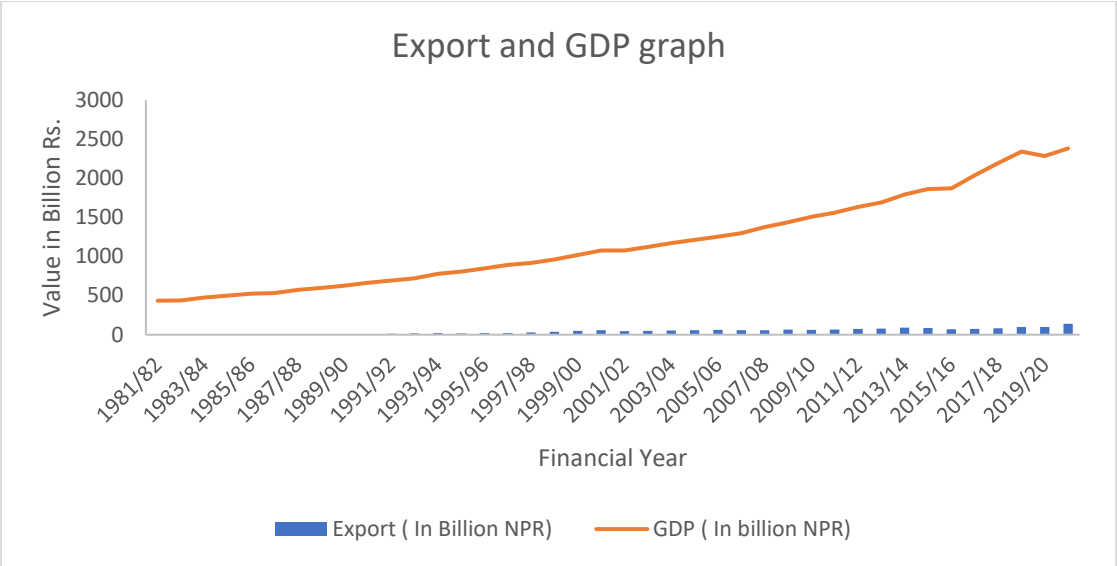


Figure 4.29 Total GDP and Export graph

The total export value books in the account of the Nepal government is increased each year. But increasing export value has not been able to meet the financial loss the Nepal government is bearing due to each year's loss on international trade. Nepal Rastra Bank has already declared that there is no sufficient reserve of foreign currency for importing products and international transactions from different countries. Recently Nepal government has banned importing luxury goods from international trade because it has a long-term impact on the reserve of foreign currency and ultimately Nepal government is facing a huge loss in international trade each year.

The forty years of data about Gross Domestic Products and Exports shows that the gross domestic product of Nepal has increased each year in an increasing trend and increased by 4.48 times compared to the last forty years starting from the financial year 1981/82. But export has been increased by 93.61 times on the monetary NPR value. This is a great achievement achieved by the exporters but still, there are a lot of challenges and opportunities which must be resolved and achieved on time for the betterment of the Nepalese economy and another hand for compensating the loss from doing international business.

4.16 Agricultural Import and relationship with Economic Growth

There is a bilateral causal relation between import and growth, which will in turn demonstrates how imports as well as economic expansion, interact. These results can

be seen as the import of goods and technology essential for the quicker expansion of the country's recently established economic system has a significant impact on the economy (Çetintaş & Barişik, 2009). Nepal has a policy for promoting the agricultural sector that includes tools for promoting exports and import-substituting. However, while being listed as receiving main concern in all of the essential quality and financial years, the agricultural industry of Nepal only receives a small percentage of the budget (S. R. Ghimire, 2009).

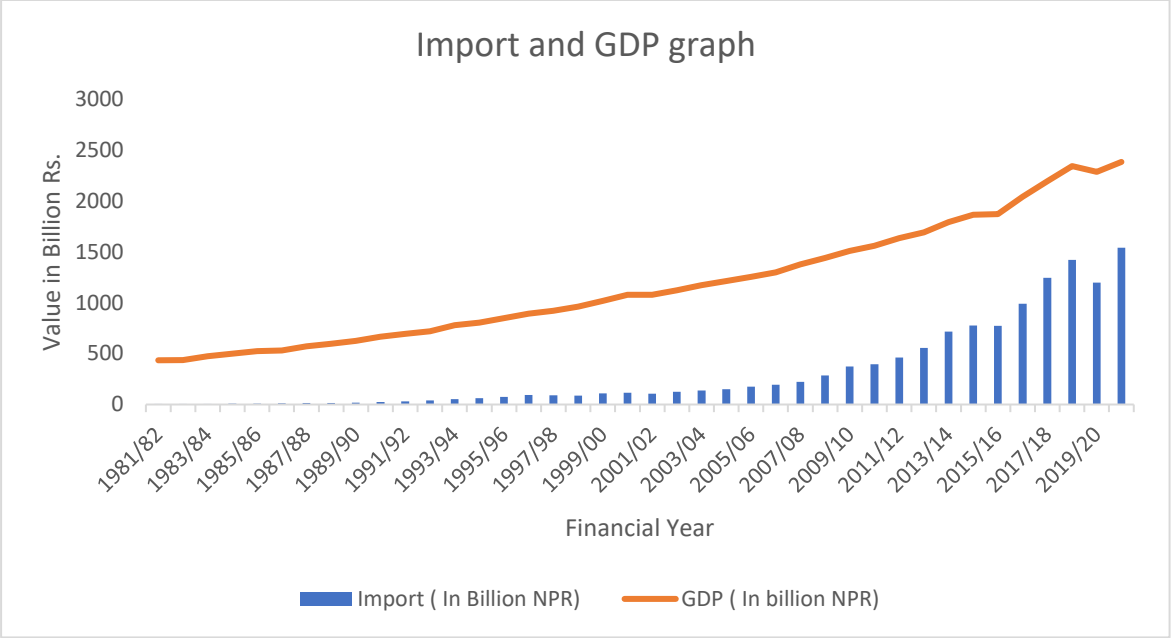


Figure 4.30 Total GDP and Import graph

The graph represents that there is an increment in the total value of imports and then the gross Domestic Product of Nepal. An increase in Importing products has both positive and negative phases. Previous research suggests that importing goods from negative impact in the short term but has benefits in long term. The forty years of data about GDP and export suggests that the gross domestic product of Nepal has increased each year in an increasing trend and increased by 4.48 times compared to the last forty years starting from the financial year 1981/82, on the other hand, the import has been increased by 311.32 times from last forty years. So, the Nepal government is facing trade loss each year and is unable to produce the food and other necessary items that are consumed in Nepal. So, to fulfill the demand of the nation the government has been compelled to import goods from other countries.

Profitable agribusiness and also the implementation of environmental protection policies while maintaining an import diversion and export promotional campaign are the paths to the nation's economic sustainable development in agriculture (S. R. Ghimire, 2009). According to a World Bank estimation report in 2018, foreign business contributed 55% of GDP, the greatest percentage in 17 years. Companies which export more than 90% of their products are exempt from customs tariffs, customs duty, and service tax. The average imposed tariff rate is 12.6% (Parajuli, 2021).

The research findings showed that compared to the industrialized world, the growing hemisphere appears to be more active in terms of both economy and international trade. Furthermore, to reiterate the outcomes of the econometric research conducted here, south-south trade is defined by greater income price elasticity than import prices from the Northern for specific segments or certain bilateral trade partnerships, especially those that involve Asian nations (Bernhardt, 2016).

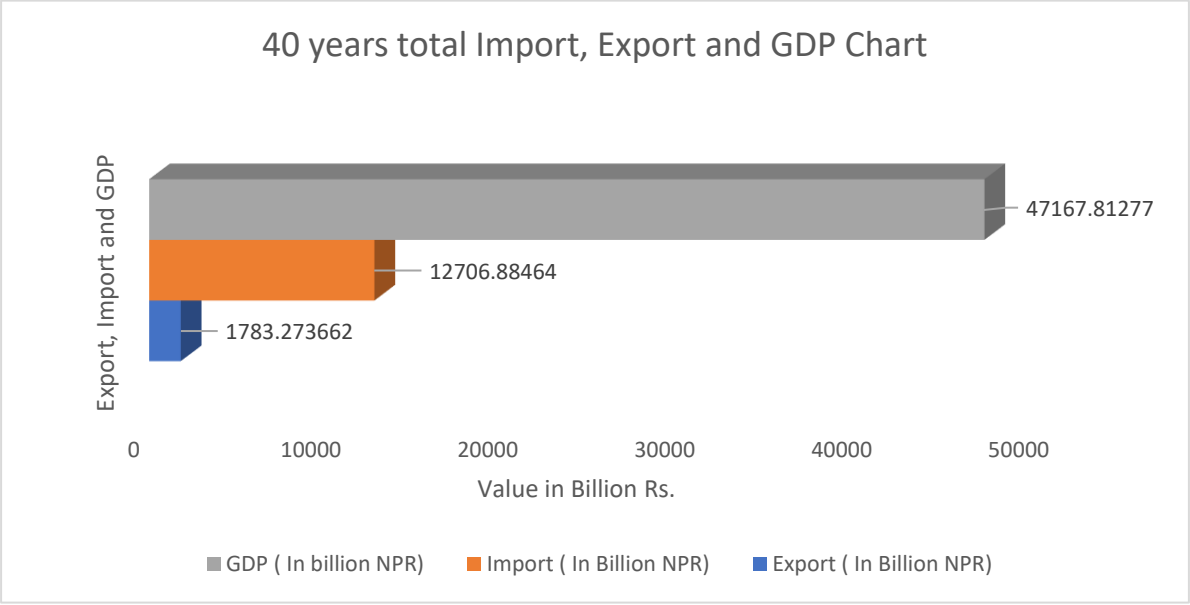


Figure 4.31 Import, Export, and GDP Chart

The above graph chart is the chart representing the total gross domestic product, the total imports, and total export of Nepal for the last forty years starting from 1981/82 to 2020/21. Only 3.78% of the total GDP has been exported from Nepal within forty years. On the other hand, 26.93% of the total gross domestic product has been imported in Nepal within the imported time and we have only exported 14.03% of the total imported

value within that time which means still we have to grow 85.97% of the current production to meet the countries import and export and which helps to make a balance of payment.

4.17 Impact of Increasing Imports on the Economy of Nepal

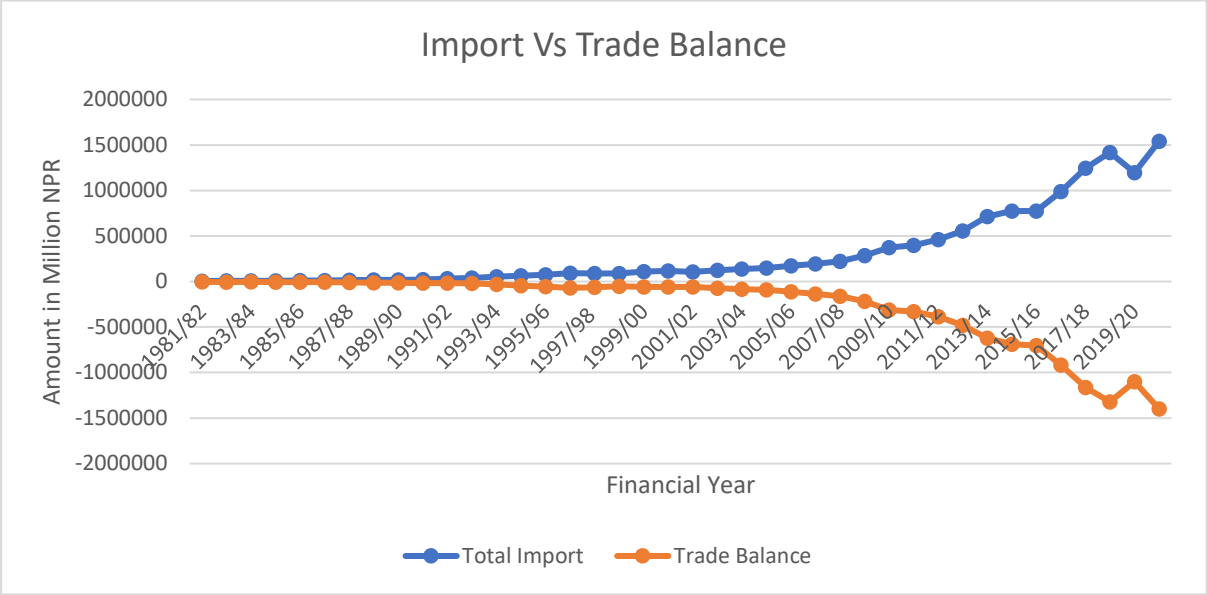


Figure 4.32 Import Vs Trade Balance

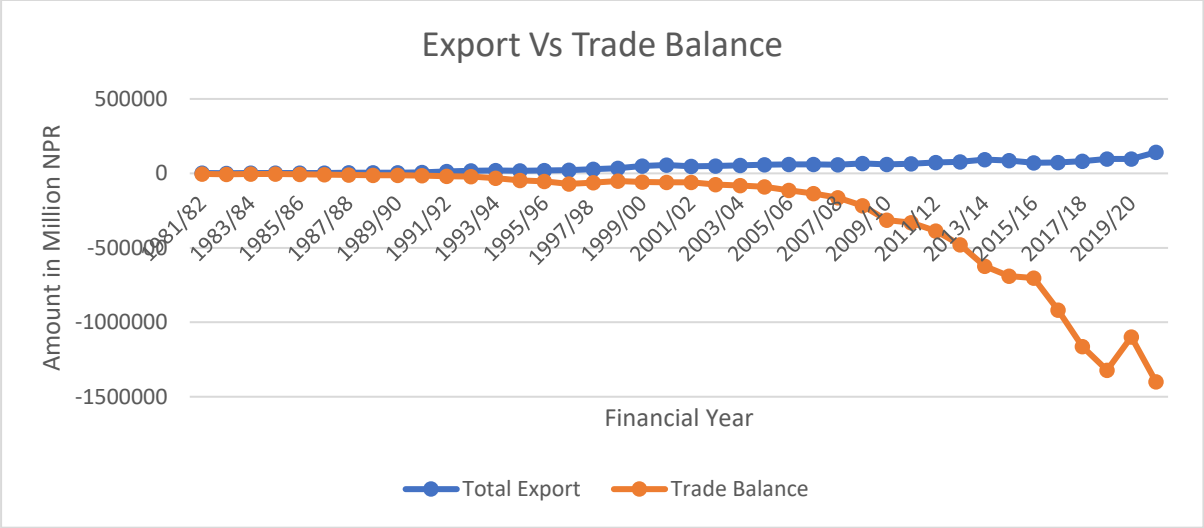


Figure 4.33 Export Vs Trade Balance

Table 4.8 Correlation between Total Import, Total Export and Trade Balance

Correlations				
		Total Import	Total Export	Trade Balance
Total Import	Pearson Correlation	1		
	Sig. (2-tailed)			
Total Export	Pearson Correlation	.853**	1	
	Sig. (2-tailed)	.000		
Trade Balance	Pearson Correlation	-.999**	-.828**	1
	Sig. (2-tailed)	.000	.000	
**. Correlation is significant at the 0.01 level (2-tailed).				

4.17.1 The Problem

Investigate the relationship between total import and Total Export

H1: There is a significant relationship between the total import and total export

4.17.2 Reporting Pearson Correlation

Pearson product correlation of total import and total export was found to be highly positive and statistically significant (r= .853, p<.001). Hence H1 was supported. This shows that an increase in the total import has increased the total export in Nepal. The 1% increase in imports has increased the .853% total output. It also shows that Import has increased faster than export.

4.17.3 The Problem

Investigate the relationship between total imports and Trade Balance

H1: There is a significant inverse relationship between the total import and total export

4.17.4 Reporting Pearson Correlation

Pearson product correlation of total import and trade balance was found to be a very high negative correlation and statistically significant (r= -.999 p<.001). Hence H1 was supported. This shows that an increase in the total import has decreased the trade balance in Nepal. There is a very high negative correlation between trade importing products with the trade balance in Nepal. So, importing goods has a very negative impact on the trade balance of Nepal. The 1% increase in imports has increased the

trade loss by .999% trade balance. It also shows that to maintain the trade balance in Nepal there is a need to decrease the import portion.

Relation between Total Import, Government Outstanding, and Foreign Currency Reserves

Table 4.9 Correlation between Total Import, Government Outstanding, and Foreign Currency Reserves

Correlations				
		Total Import	Government Outstanding	Foreign Currency Reserves
Total Import	Pearson Correlation	1		
	Sig. (2-tailed)			
Government Outstanding	Pearson Correlation	.945**	1	
	Sig. (2-tailed)	.000		
Foreign Currency Reserves	Pearson Correlation	.992**	.926**	1
	Sig. (2-tailed)	.000	.000	
**. Correlation is significant at the 0.01 level (2-tailed).				

4.17.5 The Problem

Investigate the relationship between total imports and Government Outstanding

H1: There is a significant relationship between total imports and government outstanding

4.17.6 Reporting Pearson Correlation

Pearson product correlation of total import and government outstanding was found to be a very high positive correlation and statistically significant ($r = .945$ $p < .001$). Hence H1 was supported. This shows that an increase in the total import has increased the total government outstanding in Nepal. There is a very high correlation between trade importing products with the government outstanding in Nepal. So, importing goods has a very negative impact on the trade balance of Nepal because Nepal has always increased debt which is the obligation of the Nepal government. The 1% increase in imports has increased the government's outstanding by .945% in the Nepalese economy. It also shows that to maintain the trade balance in Nepal there is a need to decrease the import portion.

4.17.7 The Problem

Investigate the relationship between total imports and Foreign currency reserve

H1: There is a significant inverse relationship between total imports and foreign currency reserves

4.17.8 Reporting Pearson Correlation

Pearson product correlation of total import and foreign currency reserve was found to be a very high positive correlation and statistically significant ($r = .992$ $p < .001$). Hence H1 was not supported and rejected and we accept the alternative hypothesis. This shows that an increase in the total import has also increased the total foreign currency reserves in Nepal. There is a very high correlation between trade importing products with the foreign currency reserves in Nepal. The 1% increase in imports has increased the total foreign currency by .992% in the Nepalese economy.

Trading is a useful way to trade freely products and services in addition to exchanging labor, capital, culture, and technological advances. There are two types of trade: surpluses and deficits. When a nation exports products and services, it generates income that is contributed to the nation's overall Gross Domestic Product. In addition, if a company buys products and services from those other nations, it must pay a price for them, which affects the Gross Domestic Product of the entire nation. When more products and services are imported rather than exported, this is known as a trade imbalance (Mahat, 2015). So, to maintain the trade imbalance there is a need of increasing export from Nepal. While importing goods and services Nepal's government has a lot of challenges to face, some challenges are short term and some are long-term challenges. Some of the direct and indirect impacts that the Nepal Government is facing from importing products are as follows:

4.18 Impact on the Reserve of Foreign Currency

Import and foreign currency reserves have always had an inverse correlation. More increment in imports from international countries tends to decrease the reserve of foreign currency. Nepal is continuously dealing with the issue of a trade imbalance as a result of the ongoing expansion in these growth differences. A trade deficit of this magnitude may deplete the nation's foreign reserve over time, endangering

macroeconomic stability (Bastola & Sapkota, 2015). On the other hand, the variation in export revenues could affect foreign exchange reserves, which would therefore limit imports of necessary financial resources goods. Due to restrictions on input and manufacturing planning, unpredictability has been a bottleneck for the nation's economic progress.

A recent study discovered that high levels of foreign exchange reserves encourage capital investment and have a favorable impact on rising output. Additionally, it doesn't appear that imports of fixed assets and private production are impacted by the volatility in exports (Gashe, 2019). According to an Iranian study using the TARCH approach, true national incomes have a beneficial effect on import prices whereas actual exchange rate volatility has an unfavorable and considerable effect on Iran's actual imports. The true rate of exchange has a large and detrimental effect on Iran's actual imports, as well (Mohammadi et al., 2011).

4.19 Impact on GDP and GNP

Over-importing has a greater negative impact on GDP and GNP than under-exporting, which is the opposite. The country's economic extreme trade shortfall increase causes a decline in demand for all domestic products and services. As a result, local producers earn less money, and decreased demand has a multiplier effect on GDP. In addition, although imports are sensitive to GDP and overall annual growth is above proportionately, a trade gap occurs in a nation when GDP growth is quicker than that of its trade agreements (Mahat, 2015).

4.19.1 Impact on the price of Local Products

The increase in imports has a greater impact on the cost of products and services than domestic output, which typically results in a trade imbalance. When imports surpass export at a higher proportion than exports, which results in inflation, a trade imbalance typically results. Nepal produces fewer agricultural commodities than other neighboring countries, which drives up manufacturing prices when compared to exporter-produced products that are imported. The price of importing agricultural commodities into Nepal is typically low because the exporting nation has a strategy of a commercial scale massive production at a cheap price. Because Nepal does have a

low amount of production and high capital cost, it isn't able to compete with goods and commercial scale low prices and always experiences a loss. Consumer prices have decreased as a result of international competition. To speed up Nepal's socioeconomic progress, trade diversification policies must be adopted (Mahat, 2015).

4.19.2 Impact on the Bank Interest Rate

Nepal is mostly dependent on imports, the majority of demand for merchandise and services comes from other exporting nations. Greater importing nations experience trade imbalances, which causes banks' rates of interest to rise as the imbalances widen. Greater debt levels have an immediate impact on interest rates because lenders charge higher rates of interest on new loans. The depreciating worth of the country's currency is also another factor contributing to increase interest rates. Interest rates and loans have a direct connection. The country's persistent trade deficit causes it to incur foreign loans, which require interest payments.

If a nation relies heavily on imports from those other nations and has relatively few exports compared to imports, there will be a sustainable imbalance. According to a study of Russia titled "The impact of Russia's Economic Crisis and Import Ban on its Agricultural and food Sector," the main macroeconomic consequences of Russia's latest geographical and financial instability are just a sharp fall in the value of the ruble relative to the United States us$ and other main currencies, hyperinflation and a massive recession, including one with a decrease in GDP and income levels. Russia was a considerably bigger agricultural importer of goods than suppliers before the 2014 disaster (Liefert et al., 2019).

4.20 Unit root test

Table 4.10 Unit Root Test

Augmented Dicky Fuller Test				
	At level		At first difference	
Variables	Intercept	Trend and Intercept	Intercept	Trend and Intercept
lnAGRIIMP	-0.06927	-1.5452	-5.92264***	-5.80981***
	0.9441	0.7905	0.0000	0.0002
lnMT	-3.11434**	-3.64376**	-6.57119***	-6.49409***
	0.0362	0.0427	0.0000	0.0000
lnRP	-3.48639**	-1.19828	-1.36565	-4.32666***

	0.0155	0.8928	0.5855	0.0093
lnECGC	0.261766	-2.0982	-4.52616***	-4.46611***
	0.9719	0.5252	0.0013	0.0072
lnEXC	-3.30893**	-3.08549	-4.02552***	-4.33286***
	0.0234	0.1278	0.0042	0.0092

In the above table three variables lnMT, ln RP, and lnEXC are stationary at level [I(0)] and the remaining variables are stationary at first difference [I(0)]. This feature allows us the process further for the ARDL F-Bounds Test. The outcome of the F-bound test is shown in the table below

4.21 ARDL Bound Test

As variables under study have a mixed order of integration as shown in table 4.11. ARDL Bound test is performed for the cointegration test.

Table 4.11 Bound Test

F-Bounds Test		Null Hypothesis: No levels of relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	10.20192	10%	1.99	2.94
K	6	5%	2.27	3.28
		2.50%	2.55	3.61
		1%	2.88	3.99

In the above table, calculated F statistics (10.20) are greater than the I(1) values which indicate the long-run relationship between variables.

4.22 Long Run Estimate

Long-run coefficients are estimated by the use of the fully modified ordinary least square method. The output is shown in the table below.

Table 4.12 Fully Modified Least Squares (FMOLS)

Dependent Variable: LnCERALPROD
Method: Fully Modified Least Squares (FMOLS)
Sample (adjusted): 1991 2019
Cointegrating equation deterministic: C
Long-run covariance estimate (Prewhitening with lags = 2 from AIC
maxlags = 2, Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LnAGRIIMPORT	0.017698	0.001902	9.306651	0.000
LnMEANTEMP	-0.64803	0.028433	-22.7912	0.000
LnRURALPOP	-0.84164	0.030908	-27.23	0.000
LnCULAREA	-0.04989	0.015631	-3.19149	0.0042
LnELEGEN	0.363801	0.005261	69.14613	0.000
LnEXCHANGE	0.066836	0.007154	9.342451	0.000
C	21.93865	0.480591	45.64933	0.000
R-squared	0.923418	Mean dependent var		8.872656
Adjusted R-squared	0.902533	S.D. dependent var		0.204948
S.E. of regression	0.063984	Sum squared resid		0.090067
Long-run variance	8.87E-06			

Import of Agricultural food products, the major variable of concern, has a positive impact on the production of agricultural food production. It indicates that the current level of import of food products has not harmed the production of food crops in Nepal. A negligible value of the coefficient indicates that the influence of the import of food products is weaker. It means a one percent increase in agricultural import affects cereal production by only 0.01 percent.

Electricity generation has a positive impact on cereal production which indicates that along with an increase in electricity generation the use of electricity for cereal production-based agricultural activity might have increased. Furthermore, it might have helped to reduce energy costs used for agricultural production motivating increasing cereal production.

The annual mean temperature has hurtled agricultural food products in Nepal which indicates that increasing temperature affects the production capacity of agricultural food products resulting in to decrease the production.

The cultivated area harms the agricultural food products in Nepal. It indicates that the cultivated area will not increase the production of agricultural food production in the long run. The production area has almost remained constant during the study period. So, other factors such as fertilizer used, and irrigation might have impacted the production side of agricultural food production in Nepal. In the long run, there seems

the possibility of the application of the law of diminishing returns due to limited area of production which might cause a decline in production.

The exchange rate has a positive impact on agricultural food production in Nepal. It indicates that an increment in the exchange rate will motivate the agricultural producer to produce more and sale of agricultural food products abroad. It means an increment in the exchange rate will generate more income from exporting agricultural food products to a foreign country

4.23 Robustness test

CCR output shows that sign of coefficients and level of significance of variables are similar to that of FMOLS. It indicates the robustness of the model.

***Table 4.13** Canonical Cointegrating Regression (CCR)*

Dependent Variable: LNCERALPROD
Method: Canonical Cointegrating Regression (CCR)
Sample (adjusted): 1991 2019
Cointegrating equation deterministic: C
Long-run covariance estimate (Prewhitening with lags = 2 from AIC
Maxlags = 2, Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LnAGRIIMPORT	0.020074	0.002512	7.990419	0
LnMEANTEMP	-0.73656	0.049916	-14.756	0
LnRURALPOP	-0.72897	0.041456	-17.584	0
LnCULAREA	-0.29887	0.022803	-13.1065	0
LnELEGEN	0.373003	0.005661	65.88476	0
LnEXCHANGE	0.067186	0.009594	7.002659	0
C	22.18662	0.608021	36.48991	0
R-squared	0.92179	Mean dependent var		8.872656
Adjusted R-squared	0.90046	S.D. dependent var		0.204948
S.E. of regression	0.064661	Sum squared resid		0.091982
Long-run variance	8.87E-06			

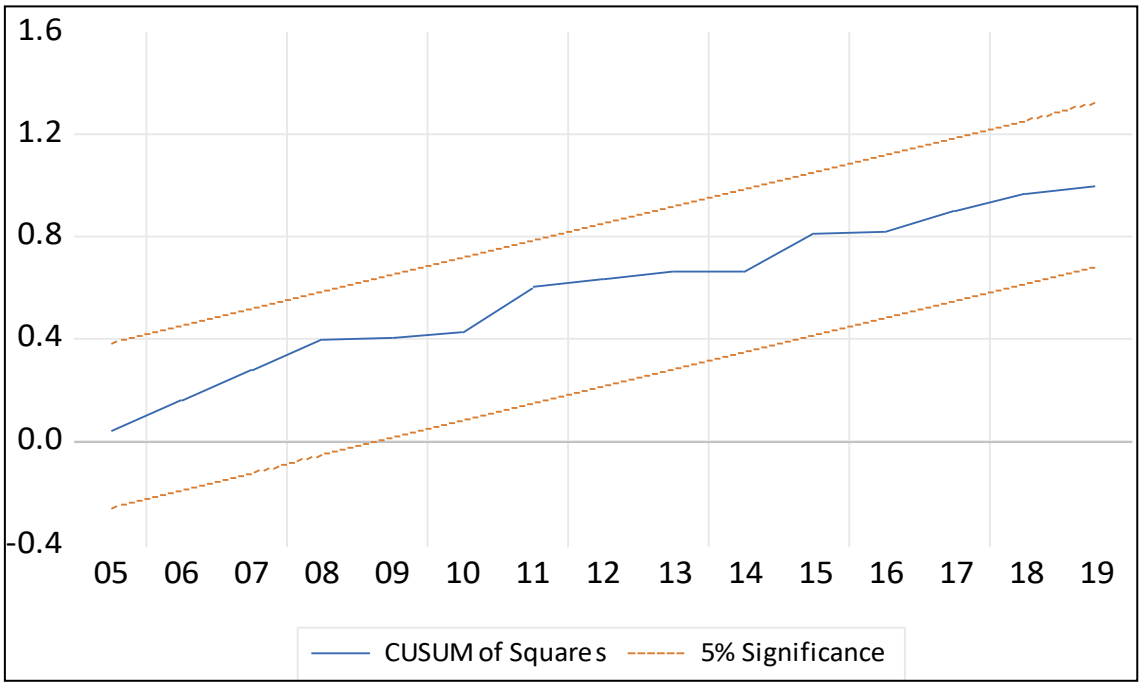


Table 4.14 Production growth projection scenarios

Production growth projection scenarios		
Determinants of production		Production growth rate*
Scenario:1	Agricultural import	0.347
Scenario:2	Temperature	-0.008
Scenario:3	Electricity Generation	2.507
Scenario:4	Exchange rate	0.123

*Production growth rate is determined based on the long run coefficient of determinants of cereal production (Table2) and the average growth trend of each determinant derived based on the ARIMA model (Autoregressive moving average model) see in Appendix

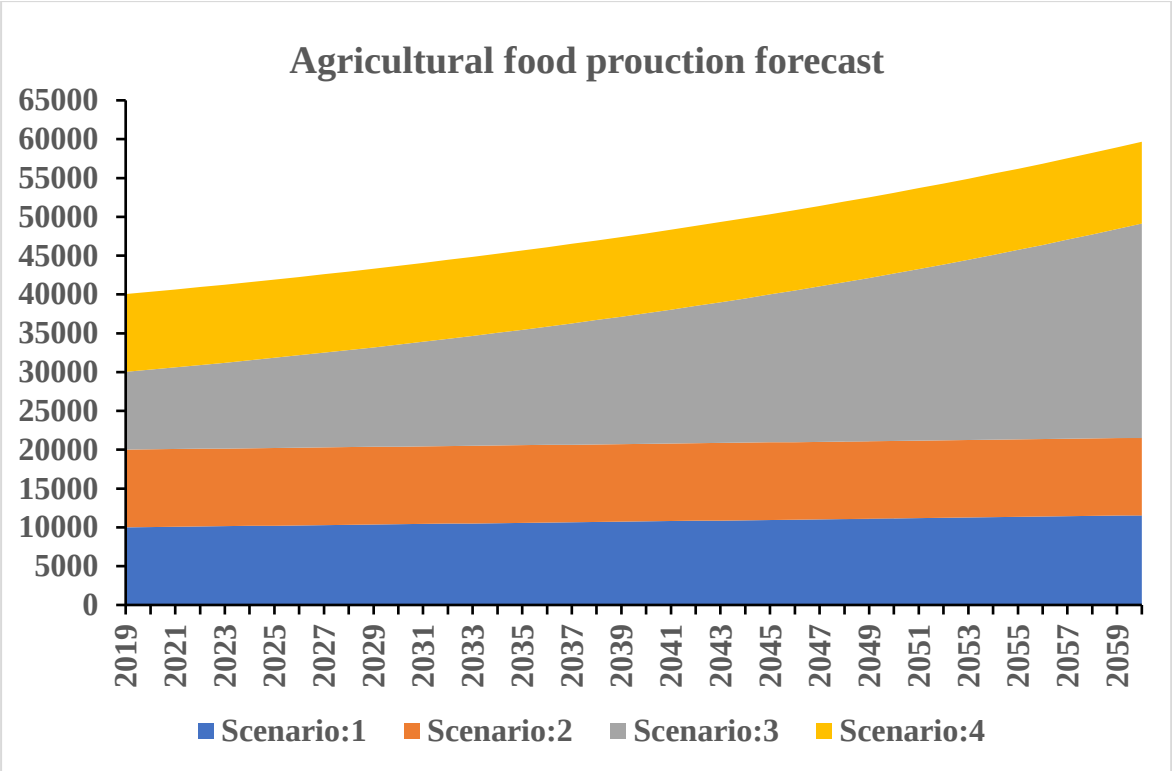


Figure 4.34 Agricultural food production forecast scenario

The figure shows that the import of agricultural food production in Nepal negatively impacted the production of cereal crops as indicated by scenario 1. Same as scenario 2 the food production will be negatively impacted because of the annual mean temperature but the electricity generation and foreign exchange rate has positively impacted the future production of agricultural food products as shown in scenario 3 and 4 respectively.

CHAPTER V: CONCLUSION AND RECOMMENDATION

Agricultural food production is one of the important sectors of the economy and which is contributing a huge portion of the national GDP to the economy of Nepal. More than two third of the total population is engaged in the agricultural sector as their main source of income. But still trade balance shows that Nepal is facing a huge loss of trade loss and importing a billion Rs in products each year which has a big impact on the overall trade sector of Nepal.

In Nepal among the five agricultural food products, Pady production has the most productivity and contributes the highest food production by using 46.91% of the total cultivated land. Barley and millet are low contributors to agricultural food production in Nepal. So, Policymakers and policy implementation have to focus on more productive crops to reduce the trade deficit in Nepal. The import trend of Nepal has not been favorable for the economy of Nepal and has to control or search for alternatives to control or minimize trade loss in Nepal.

Climate change has a huge impact on the production of agricultural food products in Nepal. Due to the excess use of fertilizer, the problem like misfortune of soli richness, a reserve of nutrients has been depletion, loss of fertilizer land, loss of crops, loss of wild plants and animals, loss of the capacity of the natural resources, development of the new diseases are wisely seen due the issue of the fertilizer consumption in Nepal. Nepal Government has to control and limit the use of fertilizer consumption for the increment productivity in Nepal.

The production of agricultural food products has played an important role in the trade balance in Nepal. Although the trend of importing is not in the favor of the economy of Nepal and needs to correct on time. The import has a direct relation with the government outstanding because the increment in the Import has increased the government outstanding of Nepal which has also impacted the reserve of the foreign currency of Nepal. So, the best solution for the trade balance and import control, and developing the culture of production in Nepal. Due to the system to trace the production loan which has been provided by the Nepal government for the production of agricultural food products in Nepal, the import side has increased each year and the investment in the

unproductive sector has increased. There is a need to search the alternative and substitute products in Nepal which will help to maintain the trade balance in Nepal.

Import of Agricultural food products, the major variable of concern, has a positive impact on the production of agricultural food production. It indicates that the current level of import of food products has not harmed the production of food crops in Nepal. A negligible value of the coefficient indicates that the influence of the import of food products is weaker. It means a one percent increase in agricultural import affects cereal production by only 0.01 percent. Electricity generation has a positive impact on cereal production which indicates that along with an increase in electricity generation the use of electricity for cereal production-based agricultural activity might have increased. Furthermore, it might have helped to reduce energy costs used for agricultural production motivating increasing cereal production.

The annual mean temperature has hurtled agricultural food products in Nepal which indicates that increasing temperature affects the production capacity of agricultural food products resulting in to decrease the production. The cultivated area hurts the agricultural food products in Nepal. It indicates that the cultivated area will not increase the production of agricultural food production in the long run. The production area has almost remained constant during the study period. So, other factors such as fertilizer used, and irrigation might have impacted the production side of agricultural food production in Nepal. In the long run, there seems a possibility of the application of the law of diminishing returns due to limited area of production which might cause a decline in production. The exchange rate has a positive impact on agricultural food production in Nepal. It indicates that an increment in the exchange rate will motivate the agricultural producer to produce more and sale of agricultural food products abroad. It means an increment in the exchange rate will generate more income from exporting agricultural food products to a foreign country

5.1 Implication

Currently, Nepal is facing trade loss each year behind trade loss there are huge problems and challenges besides that researchers are not focusing on this very vulnerable issue. This research will be highly beneficial to the stakeholders, researchers, and

policymakers who are currently dealing with international business and the stakeholder for the agricultural food products in Nepal. This research will assist in the analysis of Nepal's present import position and the development of appropriate policies for decision-makers. The decision-makers will look at this research before they take a decision. This research will also create an alarming situation for policymakers regarding the development of beneficial trade relations in Nepal.

The research will also encourage government agencies to recover from their failures to boost Nepalese agricultural productivity from loss to breakeven and breakeven to profit situation. Besides that, this research will contribute to rising awareness among stakeholders of the importance of agricultural goods and offers an alternate strategy for reducing Nepal's trade deficit. The research will also help in distributing subsidies based on the contribution and need for subsidies for the development of agricultural food products in Nepal. So, the research will be applicable and useful in the current market.

5.2 Future research/ limitations

Agriculture is the foundation of both the rural and national economies of the country, and the development of this sector is essential for economic development. The majority of Nepalese people still rely heavily on agriculture as their primary source of food, employment, and income. But Nepal Government has not given high importance or priority to the development of agricultural food products in Nepal. Although year Nepal is facing huge trade loss and Import has increased in increasing trend the export has not been exported as compared to import. So, there is a need for substitution products of the imported product which has not been researched on given importance in the Nepali economy.

The budget for the development of production in Nepal and to control trade loss is very low compared to the other sector. Huge corruption and an unstable government are also issued in Nepal for the betterment of the trade balance. The policymaker has issued a policy that has not been able to implement in the practical field because of the unstable government and the new government has its own rule and regulations. Nepal has no proper lab for research. And another main problem is researchers are focused to work

for the development of the nation but those research reports are been implemented for the development of the nation.

5.3 Recommendation

One of the main factors for the development of the nation is decreasing imports and increasing export by the increment in the production side of the country which is because of the maximum utilization of the available resources. Substitute the production of maize, and barley with Rice production because Rice has good productivity compared to Maize and Barley in Nepal. Investing in paddy production will provide good benefits. Currently days Nepal is shifted from an agricultural-based country to a remittance-based country and the majority of the youth are shifting to another country for their livelihood which has a direct impact on the production sector of Nepal.

So, the Nepal government has to make a new scheme to motivate the Nepalese who are working for another country that will be a great help to control the trade balance in Nepal. The study recommends prioritizing the expansion of rice cultivation area and area-specific practices for adapting to climate change for increasing rice production in the scenario of an almost stable rice cultivation area in the last two decades. The study recommends protecting millet-cultivated areas and retaining the active working-age population in rural areas.

The policymaker has been focusing on production rather than on import. And agriculture production must be given on a priority basis which has given a high contribution to the development of the nation. The producer has to use fertilizer for the production of agricultural food products in Nepal. In Nepal, there is a high scarcity of fertilizer and due to insufficient organic and chemical fertilizer, there seems to be low productivity of agricultural food products in Nepal. The researchers have to focus to find a substitute for imported products in Nepal which will be very helpful for the development of the economic sector of Nepal.

REFERENCE

Academicians, I. (2018). Advance and Innovative Research. 5(1).

Acharya, S. (2013). A Panel Data Analysis of Foreign Trade Determinants of Nepal: Gravity Model Approach. NRB Economic Review, 25(June 2012), 1–20.

Acharya, S., Sharma, S. R., Upreti, B. R., & Matthys, M.-L. (2021). Why Nepal's main agricultural export product, large cardamom, does not reach the world market? SN Business & Economics, 1(1). https://doi.org/10.1007/s43546-020-00014-9

Adhikari, D., & Dhoj, Y. (2020). Opportunity to Export Citrus Fruit from Nepal to China: Activities Accomplished on Plant Quarantine Concerned. International Journal of Agriculture Innovations and Research, 8(5), 2319–1473.

Adhikari, R., & Kharel, P. (2011). Table of Content. nil2–nil34. https://doi.org/10.1109/isie.2006.295718

Ali, E. B., Agyekum, E. B., & Adadi, P. (2021). Agriculture for sustainable development: A SWOT-AHP assessment of ghana's planting for food and jobs initiative. Sustainability (Switzerland), 13(2), 1–24. https://doi.org/10.3390/su13020628

Amgai, S. (2021). Local innovation documentation : a case study of Mustang district, Himalayan College of Agricultural Sciences and Technology. November.

Andrianary, M., & Antoine, P. (2019). No 主観的健康感を中心とした在宅高齢者における 健康関連指標に関する共分散構造分析Title. 2(2), 89.

Appiah, K., Du, J., & Poku, J. (2018). The ca relationship between agricultural production and carbon dioxide emissions in selected emerging economies. Environmental Science and Pollution Research, 25(25), 24764–24777. https://doi.org/10.1007/s11356-018-2523-z

Ayinde, O., Ojehomon, V., Daramola, F., & Falaki, A. (2013). Evaluation of the Effects of Climate Change on Rice Production in Niger State, Nigeria. Ethiopian Journal of Environmental Studies and Management, 6(6), 763. https://doi.org/10.4314/ejesm.v6i6.7s

Bahadur Thapa, M., & Dhimal, S. (2017). Horticulture Development in Nepal: Prospects, Challenges, and Strategies. Universal Journal of Agricultural Research, 5(3), 177–189. https://doi.org/10.13189/ujar.2017.050301

Bahadur, U., & Magar, R. (2019). Role of Agricultural Products in Foreign Trade of Nepal. International Journal of Agriculture System, 7(1), 52–64. https://doi.org/10.20956/ijas.v7i1.1819

Bahadur, U., & Magar, R. (2021). The Trend Analysis of Foreign Trade and Economic Growth of Nepal. 12(1).

Balogh, J. M., & Jámbor, A. (2020). The environmental impacts of agricultural trade: A systematic literature review. Sustainability (Switzerland), 12(3), 1–16. https://doi.org/10.3390/su12031152

Bandara, J. S., & Cai, Y. (2014). The impact of climate change on food crop productivity, food prices, and food security in South Asia. Economic Analysis and Policy, 44(4), 451–465. https://doi.org/10.1016/j.eap.2014.09.005

Baral, B. N. (n.d.). NEPAL-CHINA- INDIA : PROSPECTS AND CHALLENGES OF TRILATERALISMusal. XIX, 1–20.

Baral, T. N. (2018). Border Disputes and Its Impact on Bilateral Relation: A Case of Nepal- India International Border Management. Journal of APF Command and Staff College, 1(1), 28–36. https://doi.org/10.3126/japfcsc.v1i1.26710

Basnet, B. M. S. (2012). Rice: Water, Food Security, and Climate Change in Nepal. Hydro Nepal: Journal of Water, Energy, and Environment, January 2007, 78–80. https://doi.org/10.3126/hn.v11i1.7217

Bastola, U., & Sapkota, P. (2015). T h e J o u r n a l o f D e v e l o p i n g A r e a s CAUSALITY BETWEEN TRADE AND ECONOMIC GROWTH IN A LEAST DEVELOPED ECONOMY: EVIDENCE FROM NEPAL. 49(4), 197–213.

Becker, G. S., & Ave, I. (2007). Food and Agricultural Imports from China Updated July 17, 2007 Specialist in Agricultural Policy Resources, Science, and Industry Division.

Bernhardt, T. (2016). South-South trade and South-North trade: Which contributes more to development in Asia and South America? Insights from estimating income elasticities of import demand. CEPAL Review, 2016(118), 97–114. https://doi.org/10.18356/056e0f80-en

Bhandari, D., Shrestha, R., & Joshi, B. K. (2019). National Winter Crops Workshop. November, 672–686.

Bhatia, J. K. (2021). Export-Import Performance of Major Agricultural Commodities in India. Economic Affairs, 66(1). https://doi.org/10.46852/0424-2513.1.2021.15

Bhattarai, D. P., & Shakya, N. M. (2019). Conjunctive Use of Water Resources in Sustainable Development of Agriculture in Terai Nepal. Journal of the Institute of Engineering, 15(2), 210–217. https://doi.org/10.3126/jie.v15i2.27668

Çetintaş, H., & Barişik, S. (2009). Export, import, and economic growth: The case of transition economies. Transition Studies Review, 15(4), 636–649. https://doi.org/10.1007/s11300-008-0043-0

Chandio, A. A., Akram, W., Bashir, U., Ahmad, F., Adeel, S., & Jiang, Y. (2022). Sustainable maize production and climatic change in Nepal: robust role of climatic and non-climatic factors in the long-run and short-run. In Environment, Development, and Sustainability (Issue 0123456789). Springer Netherlands. https://doi.org/10.1007/s10668-022-02111-1

Chandio, A. A., Jiang, Y., Ahmad, F., Adhikari, S., & Ain, Q. U. (2021). Assessing the impacts of climatic and technological factors on rice production: Empirical evidence from Nepal. Technology in Society, 66(April), 101607. https://doi.org/10.1016/j.techsoc.2021.101607

Chandio, A. A., Jiang, Y., & Rehman, A. (2019). Energy consumption and agricultural economic growth in Pakistan: is there a nexus? International Journal of Energy Sector Management, 13(3), 597–609. https://doi.org/10.1108/IJESM-08-2018-0009

Chandio, A. A., Magsi, H., & Ozturk, I. (2020). Examining the effects of climate change on rice production: a case study of Pakistan. Environmental Science and Pollution Research, 27(8), 7812–7822. https://doi.org/10.1007/s11356-019-07486-9

Chaudhary, D. (2018). Agricultural Policies and Rural Development in Nepal: An Overview. Research Nepal Journal of Development Studies, 1(2), 34–46. https://doi.org/10.3126/rnjds.v1i2.22425

Dahal, G. (2018). Girdhari Dahal-47. Journal of Political Science, XVIII, 46–61.

Dawson, P. J. (2005). Agricultural exports and economic growth in less developed countries. Agricultural Economics, 33(2), 145–152. https://doi.org/10.1111/j.1574-0862.2005.00358.x

Devkota, N., Phuyal, R. K., & Shrestha, D. L. (2018). Cost and benefit analysis of the adoption of climate change adaptation options among rural rice farmers in Nepal. Asian Journal of Agriculture and Rural Development, 7(7), 136–148. https://doi.org/10.18488/journal.1005/2017.7.7/1005.7.136.148

Economics, A., & Library, D. (n.d.-a). This document is discoverable and free to researchers across the globe due to the work of AgEcon Search. Help ensure our sustainability. Agricultural Production and Economic Growth in Nigeria :

Economics, A., & Library, D. (n.d.-b). This document is discoverable and free to researchers across the globe due to the work of AgEcon Search. Impact of Climate Change on Paddy Production : Evidence from Nepal.

Elobeid, A., Carriquiry, M., Dumortier, J., Swenson, D., & J. Hayes, D. (2021). China-U.S. trade dispute and its impact on global agricultural markets, the U.S. economy, and greenhouse gas emissions. Journal of Agricultural Economics, 72(3), 647–672. https://doi.org/10.1111/1477-9552.12430

Feenstra, R., & Hong, C. (2022). China's import demand for agricultural products: The impact of the Phase One trade agreement. Review of International Economics, 30(1), 345–368. https://doi.org/10.1111/roie.12568

G.T, A., Haruna, U., & Abdusalam, R. Y. (2014). Trend Analysis of the Contribution of Agriculture to the Gross Domestic Product of Nigeria (1960 - 2012). IOSR Journal of Agriculture and Veterinary Science, 7(1), 50–55. https://doi.org/10.9790/2380-07145055

Gairhe, S., Timsina, K. P., Ghimire, Y. N., Lamichhane, J., Subedi, S., & Shrestha, J. (2021). Production and distribution system of maize seed in Nepal. Heliyon, 7(4), e06775. https://doi.org/10.1016/j.heliyon.2021.e06775

Gar, J., Nations, U., & Gar, J. (2016). Review of the African millet diversity Review of the African millet diversity. January 2001.

Gardebroek, C.1 and Hernandez, M. . (n.d.). This document is discoverable and free to researchers across the globe due to the work of AgEcon Search. Help ensure our sustainability. Modeling Outcomes and Assessing Market.

Gashe, L. A. (2019). Long Run Effects of Export Instability on Economic Growth of Ethiopia: Cointegration Analysis. Journal of Economics and Sustainable Development, 10(9), 32–39. https://doi.org/10.7176/jesd/10-9-06

Gauchan, D., & International, B. (2018). Agricultural Development in Nepal : Contribution to Economic Growth, Food Security and Poverty Agricultural Development in Nepal : Contribution to Economic Growth, Food Security and Poverty Reduction. January 2008.

GC, A. (2018). A SWOT analysis of Nepalese agricultural policy. International Journal of Agriculture, Environment and Food Sciences, 2, 119–123. https://doi.org/10.31015/jaefs.18020

GC, A., Yeo, J.-H., & Ghimire, K. (2019). Determinants of Farm Mechanization in Nepal. Turkish Journal of Agriculture - Food Science and Technology, 7(1), 87. https://doi.org/10.24925/turjaf.v7i1.87-91.2131

Geetha, R., Ravisankar, T., Patil, P. K., Avunje, S., Vinoth, S., Sairam, C. V., & Vijayan, K. K. (2020). Trends, causes, and indices of import rejections in international shrimp trade with special reference to India: a 15-year longitudinal analysis. Aquaculture International, 28(3), 1341–1369. https://doi.org/10.1007/s10499-020-00529-w

Ghimire, A., Weiwei, F., & Zhuang, P. (2021). Does Agricultural Export Promote Nepalese Economic Growth? ARDL Approach Using Structural Break. E3S Web of Conferences, 275. https://doi.org/10.1051/e3sconf/202127501024

Ghimire, S. R. (2009). Environmental Concern in Nepalese Agriculture. Journal of Agriculture and Environment, 9, 41–45. https://doi.org/10.3126/aej.v9i0.2115

Gouda, S., Kerry, R. G., Das, G., Paramithiotis, S., Shin, H. S., & Patra, J. K. (2018). Revitalization of plant growth promoting rhizobacteria for sustainable development in agriculture. Microbiological Research, 206(April 2017), 131–140. https://doi.org/10.1016/j.micres.2017.08.016

Guesmi, B. (2013). at ca de Catalun ya Doctoral Thesis : " The productive efficiency in agriculture : recent methodological advances " By. Universitat Politècnica de Catalunya Institut de Sostenibilitat, November. https://www.researchgate.net/publication/285578010_The_productive_efficiency_in_agriculture_recent_methodological_advances

Gurung, L. (1994). Exploring Links between Tourism and Agriculture in Sustainable Development: A Case Study of Kagbeni VDC, Nepal.

Gyawali, P., & Khanal, S. (2021). Overview of Agriculture in Nepal: Issues and strategies to cope with. Fundamental and Applied Agriculture, 6(0), 1. https://doi.org/10.5455/faa.89753

Hamuda, H. E. a F. B., & Patkó, I. (2010). Relationship between Environmental Impacts and Modern Agriculture. 1(1), 87–98.

Harlan, H. V., & Martini, M. L. (1936). Problems and Results in Barley Breeding. Yearbook of Agriculture, 303–346. http://naldc.nal.usda.gov/download/IND43893522/PDF

Hussain, S., Huang, J., Huang, J., Ahmad, S., Nanda, S., Anwar, S., Shakoor, A., Zhu, C., Zhu, L., Cao, X., Jin, Q., & Zhang, J. (2020). Rice Production Under Climate Change: Adaptations and Mitigating Strategies. Environment, Climate, Plant and Vegetation Growth, June, 659–686. https://doi.org/10.1007/978-3-030-49732-3_26

Jatuporn, C., Chien, L.-H., Sukprasert, P., & Thaipakdee, S. (2011). Does A Long-Run Relationship Exist between Agriculture and Economic Growth in Thailand? International Journal of Economics and Finance, 3(3). https://doi.org/10.5539/ijef.v3n3p227

Joshi, B. K., & Paudyal, K. P. (2004). AGRICULTURAL RESEARCH FOR ENHANCING LIVELIHOOD OF NEPALESE Bal K Joshi, Samundra L Joshi and Krishna P Paudyal, Editors. June 2019.

Joshi, N. P., Maharjan, K. L., Piya, L., & Tamang, D. T. (2017). 7 . North-South Agricultural Trade Dependence in Nepal and Reliance on Import. December.

Joshi, T., Poudel, R. P., Kafle, K., Bhattarai, B., Prasai, B. P., & Adhikari, S. (2022). Assessing the Impacts of the COVID-19 Pandemics on Sustainable Development Goals in Nepal. Frontiers in Sustainable Food Systems, 6(March 2020), 1–5. https://doi.org/10.3389/fsufs.2022.852759

K. Adhikari, R. (2012). Economics of finger millet (Elecusine coracana G.) production and marketing in the peri-urban area of Pokhara valley of Nepal. Journal of Development and Agricultural Economics, 4(6), 151–157. https://doi.org/10.5897/jdae11.119

Kandel, B. P. (2021). Status, prospect, and problems of hybrid maize (Zea mays L.) in Nepal: a brief review. Genetic Resources and Crop Evolution, 68(1), 1–10. https://doi.org/10.1007/s10722-020-01032-0

Karkee, M. (2008). Nepal Economic Growth Assessment - Agriculture. USAID Nepal, August.

Karki, R., & Gurung, A. (2012). An Overview of Climate Change And Its Impact on Agriculture: a Review From Least Developing Country, Nepal. International Journal of Ecosystem, 2(2), 19–24. https://doi.org/10.5923/j.ije.20120202.03

Kaur, H., Shaveta, S., Kaur, S., Sharma, V., & Kaur, K. (2019). Hulless Barley: A new era of research for food purposes. Wheat and Barley Research, 11(2). https://doi.org/10.25174/2249-4065/2019/83719

KC, G., Karki, T. B., Shrestha, J., & Achhami, B. B. (2015). Status and prospects of maize research in Nepal. Journal of Maize Research and Development, 1(1), 1–9. https://doi.org/10.3126/jmrd.v1i1.14239

KEHO, Y. (2017). The Exports and Economic Growth Nexus in Cote D ivoire: Evidence from a Multivariate Time Series Analysis. Asian Journal of Economic Modelling, 5(2), 135–146. https://doi.org/10.18488/journal.8/2017.5.2/8.2.135.146

Khanal, U., Wilson, C., Hoang, V. N., & Lee, B. (2018). Farmer's Adaptation to Climate Change, Its Determinants, and Impacts on Rice Yield in Nepal. Ecological Economics, 144(July 2017), 139–147. https://doi.org/10.1016/j.ecolecon.2017.08.006

Khatiwada, S. (2020). Effects of Macroeconomic Factors on Gross Domestic Product in Nepal. Researcher: A Research Journal of Culture and Society, 4(2), 91–104. https://doi.org/10.3126/researcher.v4i2.34627

Laborde, J. P., Wortmann, C. S., Blanco-Canqui, H., McDonald, A. J., & Lindquist, J. L. (2019). Simulation-based maize–wheat cropping system optimization in the midhills of Nepal. Agronomy Journal, 111(5), 2569–2581. https://doi.org/10.2134/agronj2018.08.0509

Lancker, E., & Nijkamp, P. (2000). A policy scenario analysis of sustainable agricultural development options: A case study for Nepal. Impact Assessment and Project Appraisal, 18(2), 111–124. https://doi.org/10.3152/147154600781767493

Lee, W. C., Hoe, N., Viswanathan, K. K., & Baharuddin, A. H. (2019). an Economic Analysis of Anthropogenic Climate Change on Rice Production in Malaysia. Malaysian Journal of Sustainable Agriculture, 4(1), 01–04. https://doi.org/10.26480/mjsa.01.2020.01.04

Liefert, W. M., Liefert, O., Seeley, R., & Lee, T. (2019). The effect of Russia's economic crisis and an import ban on its agricultural and food sector. Journal of Eurasian Studies, 10(2), 119–135. https://doi.org/10.1177/1879366519840185

Magar, U. R. (2020). Identifying the Role of Paddy in the Economic Development of Nepal. The Journal of Economic Concerns, 11(1), 79–86.

Mahat, B. (2015). Impact of Trade Deficit in Nepalese Economy Deficit in Merchandise Trade. 1–64.

Makun, H., & Ojochenemi, A. D. (2014). Determination of Aflatoxins in Sesame, Rice, Millet and Acha from Nigeria using HPLC. Chemical Science Transactions, October. https://doi.org/10.7598/cst2014.749

Malla, S., Bista, L., Rosyara, U., & Sapkota, B. (2022). Effect of unseasonal rainfall on rice production in Nepal during the year 2021 : A case study Effect of unseasonal rainfall on rice production in Nepal during the year 2021 : A case study. June.

Matthews, D., Politics, D., Asia, E., & Asia, E. (2006). Globalization and Poverty The TRIPs agreement.

Mishra, A. K. (2021). Impact of Agriculture on Economic Development of Nepal using Statistical Model. Journal of Advanced Research in Alternative Energy, Environment and Ecology, 8(2), 1–3. https://doi.org/10.24321/2455.3093.202101

Mohammadi, T., Taghavi, M., & Bandidarian, A. (2011). The Effect of Exchange Rate Uncertainty on Import: TARCH Approach. Int. J. Manag. Bus. Res, 1(4), 211–220. http://www2.sid.ir/en/VEWSSID/J_pdf/1022220110404.pdf

Nayava, J. (2017). Monsoonal rainfall and its impact on rice production in Nepal. Rice Science and Technology in Nepal, Cdd, 497–506.

Nayava, J. L., Singh, R., & Bhatta, M. R. (1970). Impact of Climate, Climate Change and Modern Technology on Wheat Production in Nepal: A Case Study at Bhairahawa. Journal of Hydrology and Meteorology, 6(1), 1–14. https://doi.org/10.3126/jhm.v6i1.5479

Newton, A. C., Flavell, A. J., George, T. S., Leat, P., Mullholland, B., Ramsay, L., Revoredo-Giha, C., Russell, J., Steffenson, B. J., Swanston, J. S., Thomas, W. T. B., Waugh, R., White, P. J., & Bingham, I. J. (2011). Crops that feed the world 4. Barley: a resilient crop? Strengths and weaknesses in the context of food security. Food Security, 3(2), 141–178. https://doi.org/10.1007/s12571-011-0126-3

Njuki, J., Kaler, A., & Parkins, J. R. (2016). Conclusion towards gender transformative agriculture and food systems: Where next? In Transforming Gender and Food Security in the Global South.

Okyere, I. (2020). The Impact of Export and Import on the Economic Growth of Ghana. European Journal of Business and Management, August. https://doi.org/10.7176/ejbm/12-21-15

Pant, B. (2005). Nepal's Trade Sector: Review, Repercussions, and Recommendations. NRB Economic Review, 17, 86–112. https://ideas.repec.org/a/nrb/journl/v17y2005p86-112.html

Pant, K. P. (2007). Environmental implications of agriculture trade in Nepal. Journal of Agriculture and Environment, 8, 30–38. https://doi.org/10.3126/aej.v8i0.724

Panta, H., Devkota, M. L., & Banjade, D. (2022). Exports and Imports-Led Growth: Evidence from a Small Developing Economy. Journal of Risk and Financial Management, 15(1). https://doi.org/10.3390/jrfm15010011

Parajuli, R. (2021). A Study on Impact of Foreign Trade In GDP of Nepal. Interdisciplinary Journal of Management and Social Sciences, 2(1), 165–171. https://doi.org/10.3126/ijmss.v2i1.36755

Paudel, G. P., Shah, M., Khandelwal, P., & Justice, S. E. (2018). Determinants, Impact, and Economics of Reaper Adoption in the Rice-Wheat Systems of Nepal Adoption, Impact, and Economics of Reaper in Smallholders Rice-Wheat Systems of Nepal Manisha Shah *, Preity Khandelwal *, Gokul Paudel 1, Scott Justice, Stephen B. October.

Paudel, M. (2013). Rice (Oryza sativa L) is cultivation in the highest elevation of the world. Agronomy Journal of Nepal, 2, 31–41. https://doi.org/10.3126/ajn.v2i0.7519

Paudel, R. C., & Burke, P. J. (2015). Exchange rate policy and export performance in a landlocked developing country: The case of Nepal. Journal of Asian Economics, 38, 55–63. https://doi.org/10.1016/j.asieco.2015.04.003

Paudel, R., & Poudel, P. (2020). Grouping of Agricultural Plant Genetic Resources in Education System of Nepal Working Groups of Agricultural Plant Genetic Resources (APGRs) in Nepal. Proceedings of National Workshop, 21-22 June 2018, Kathmandu (Issue September).

Peigné, J., Casagrande, M., Payet, V., David, C., Sans, F. X., Blanco-Moreno, J. M., Cooper, J., Gascoyne, K., Antichi, D., Bàrberi, P., Bigongiali, F., Surböck, A., Kranzler, A., Beeckman, A., Willekens, K., Luik, A., Matt, D., Grosse, M., Heß, J., … Mäder, P. (2016). How organic farmers practice conservation agriculture in Europe. Renewable Agriculture and Food Systems, 31(1), 72–85. https://doi.org/10.1017/S1742170514000477

Phuyal, R. K., Devkota, N., & Shrestha, D. L. (2017). Climate Change Adaptation related Hindrances among Rice Farmers in Nepal: Farm Level Analysis. Journal of Development and Administrative Studies, 25(1–2), 1–10. https://doi.org/10.3126/jodas.v25i1-2.23434

Pingali, P. (2007). Agricultural growth and economic development: A view through the globalization lens. Agricultural Economics, 37(S1), 1–12. https://doi.org/10.1111/j.1574-0862.2007.00231.x

Piya, S., Kiminami, A., & Yagi, H. (2010). Evaluating the impact of geographic concentration on nepalese agricultural export. South Asia Economic Journal, 11(2), 207–222. https://doi.org/10.1177/139156141001100203

Pokhrel, A., & Soni, P. (2019). Energy balance and environmental impacts of rice and wheat production: A case study in Nepal. International Journal of Agricultural and Biological Engineering, 12(1), 201–207. https://doi.org/10.25165/j.ijabe.20191201.3270

Pomortsev, A. A., Martynov, S. P., & Lyalina, E. V. (2012). Polymorphism of hordein-coding loci in barley (Hordeum vulgare L.) populations from the countries of Eastern Asia (China, Nepal, Pakistan, India). Russian Journal of Genetics, 48(8), 792–807. https://doi.org/10.1134/S1022795412050183

Press, C. (2017). Some Trade Problems of Landlocked Nepal Author (s): T . K . Jayaraman and O . L . Shrestha Published by : University of California Press Stable URL : http://www.jstor.org/stable/2643448. 16(12), 1113–1123.

Press, C. (2018). India and Nepal : The Political Economy of a Relationship Author (s): Pashupati Shumshere J . B . Rana Published by : University of California Press Stable URL : https://www.jstor.org/stable/2642972. 11(7), 645–660.

Pudasainee, A., Chaulagai, T. R., Ghimire, Y. N., & Chaulagain, B. P. (2018). Drivers of transition from export to import of rice in Nepal. Nepalese Journal of Agricultural Sciences, 17, 208–216. https://d1wqtxts1xzle7.cloudfront.net/58180222/A_Pudasainee_Drivers_of_---.pdf?1547461200=&response-content-disposition=inline%3B+filename%3DDrivers_of_transition_from_export_to_imp.pdf&Expires=1629710788&Signature=GEv7nENtjokmcLjAaqdQeCfpFxu2X8utwfObZZl~

Ragupathy, S., Dhivya, S., Patel, K., Sritharan, A., Sambandan, K., Gartaula, H., Sathishkumar, R., Khadka, K., Nirmala, B. C., Kumari, A. N., & Newmaster, S. G. (2016). DNA record of some traditional small millet landraces in India and Nepal. 3 Biotech, 6(2), 1–19. https://doi.org/10.1007/s13205-016-0450-6

Remeikiene, R., Gaspareniene, L., & Volkov, A. (2018). Evaluation of the influence of the export of agricultural products on the baltic states economic growth. Montenegrin Journal of Economics, 14(3), 83–94. https://doi.org/10.14254/1800-5845/2018.14-3.6

Sainju, R. S. (2021). Assessment of Trade and Competitiveness Barriers to Nepal’s Export Sector. II.

Sapkota, S., Paudel, M. N., Thakur, N. S., Nepali, M. B., & Neupane, R. (1970). Effect of Climate Change on Rice Production: A Case of Six VDCs in Jumla District. Nepal Journal of Science and Technology, 11, 57–62. https://doi.org/10.3126/njst.v11i0.4124

Semwal, R. L., Nautiyal, S., Sen, K. K., Rana, U., Maikhuri, R. K., Rao, K. S., & Saxena, K. G. (2004). Patterns and ecological implications of agricultural land-use changes: A case study from central Himalaya, India. Agriculture, Ecosystems and Environment, 102(1), 81–92. https://doi.org/10.1016/S0167-8809(03)00228-7

Sharma Gaudel, Y. P. (2022). Agricultural Self-Sufficiency: Ensuring Sustainable Economic Development in Nepal. Prithvi Academic Journal, 5(May), 196–203. https://doi.org/10.3126/paj.v5i1.45052

Sharma, R., Kumar, A., & Joshi, P. K. (2017). Nepal-India Agricultural Trade: Trends, Issues, and Prospects. Agricultural Economics Research Review, 30(2), 245. https://doi.org/10.5958/0974-0279.2017.00046.5

Sharma, S. (2020). Direction and Problems of Foreign Trade in Nepal. Rupantaran: A Multidisciplinary Journal, 4(1), 143–152. https://doi.org/10.3126/rupantaran.v4i1.34210

Shrestha, M. B. (2017). Cooperation on finance between China and Nepal: Belt and Road initiatives and investment opportunities in Nepal. Journal of Finance and Data Science, 3(1–4), 31–37. https://doi.org/10.1016/j.jfds.2017.09.004

Shrestha, P. K. (2022). Trade Liberalization Process and Its Impact on Agriculture Sector in Nepal. The EFFORTS, Journal of Education and Research, 4(1), 52–80. https://doi.org/10.3126/ejer.v4i1.44172

Shrestha, R. K. (2021). Direction of Foreign Trade of Nepal. Dristikon: A Multidisciplinary Journal, 11(1), 155–168. https://doi.org/10.3126/dristikon.v11i1.39156

Silwal, R., Pellegrini, L., & Nicholas, H. (2008). Graduate School of Development Studies The Causes of Trade Deficit of Nepal.

Simkhada, S. (2019). Review on Nepal's Increasing Agricultural Import. Acta Scientific Agriculture, 3(10), 77–78. https://doi.org/10.31080/asag.2019.03.0650

Sinnarong, N., Chen, C. C., McCarl, B., & Tran, B. L. (2019). Estimating the potential effects of climate change on rice production in Thailand. Paddy and Water Environment, 17(4), 761–769. https://doi.org/10.1007/s10333-019-00755-w

Storm, S. (2003). Transition problems in policy reform: Agricultural trade liberalization in India. Review of Development Economics, 7(3), 406–418. https://doi.org/10.1111/1467-9361.00199

Supply, A. E., & Demand, I. (1994). Analysis of Agricultural Export Supply and Import Demand in Mainland China Analysis of Agricultural Export Supply and Import Demand in Mainland China. December.

Taneja, N., Bimal, S., & Dayal, I. (2016). An Analysis of Nepal's Transit through India. Indian Council for Research on International Economic Relations (ICRIER), March, 1. https://think-asia.org/handle/11540/6529

Thagunna, K. S., & Acharya, S. (2013). Empirical analysis of remittance inflow: The case of Nepal. International Journal of Economics and Financial Issues, 3(2), 337–344.

Thapa, S., Ghimire, A., Adhikari, J., Thapa, A., & Thapa, B. (2020). Impacts of sowing and climatic conditions on wheat yield in Nepal. Malaysian Journal of Halal Research, 3(1), 38–40. https://doi.org/10.2478/mjhr-2020-0006

Upadhyaya, Y. M. (2019). A Comparative Analysis of Agriculture and Economic Development of Nepal with Kautilya Arthashastra. BİLTÜRK. The Journal of Economics and Related Studies, 1(2), 131–149. https://orcid.org/0000-0003-3089-3615

Wang, H. H., & Ke, B. (2005). Efficiency tests of agricultural commodity futures markets in China. Australian Journal of Agricultural and Resource Economics, 49(2), 125–141. https://doi.org/10.1111/j.1467-8489.2005.00283.x

Wassmann, R., Jagadish, S. V. K., Heuer, S., Ismail, A., Redona, E., Serraj, R., Singh, R. K., Howell, G., Pathak, H., & Sumfleth, K. (2009). Chapter 2 Climate Change Affecting Rice Production. The Physiological and Agronomic Basis for Possible Adaptation Strategies. In Advances in Agronomy (1st ed., Vol. 101, Issue January). Elsevier Inc. https://doi.org/10.1016/S0065-2113(08)00802-X

Woods, N., International, S., Royal, A., & Affairs, I. (2017). The Shifting Politics of Foreign Aid Linked references are available on JSTOR for this article : 81(2), 393–409.

Working, A., & Series, P. (2010). Improving regional trade procedures and processes : A business process analysis of export of vegetable ghee from Nepal to India and China and import of textile from India to Nepal I m p r o v i n g R e g i o n a l T r a d e P r o c e d u r e s a n d P r o.

Xu, S. W., Li, G. Q., & Li, Z. M. (2015). China's agricultural outlook for 2015-2024 is based on China Agricultural Monitoring and Early-warning System (CAMES). Journal of Integrative Agriculture, 14(9), 1889–1902. https://doi.org/10.1016/S2095-3119(15)61149-2

Yao, S. (2000). How important is agriculture in China’s economic growth? Oxford Development Studies, 28(1), 33–49. https://doi.org/10.1080/713688306

Zamrodah, Y. (2016). 済無No Title No Title No Title. 15(2), 1–23.

Zhao, J., Luo, Q., Deng, H., & Yan, Y. (2008). Opportunities and challenges of sustainable agricultural development in China. Philosophical Transactions of the Royal Society B: Biological Sciences, 363(1492), 893–904. https://doi.org/10.1098/rstb.2007.2190

Zobov, A. M., Degtereva, E. A., Chernova, V. Y., & Starostin, V. S. (2017). Comparative analysis of the best practices in the economic policy of import substitution. European Research Studies Journal, 20(2), 507–520.

APPENDIX

Four scenarios

Electricity Generation

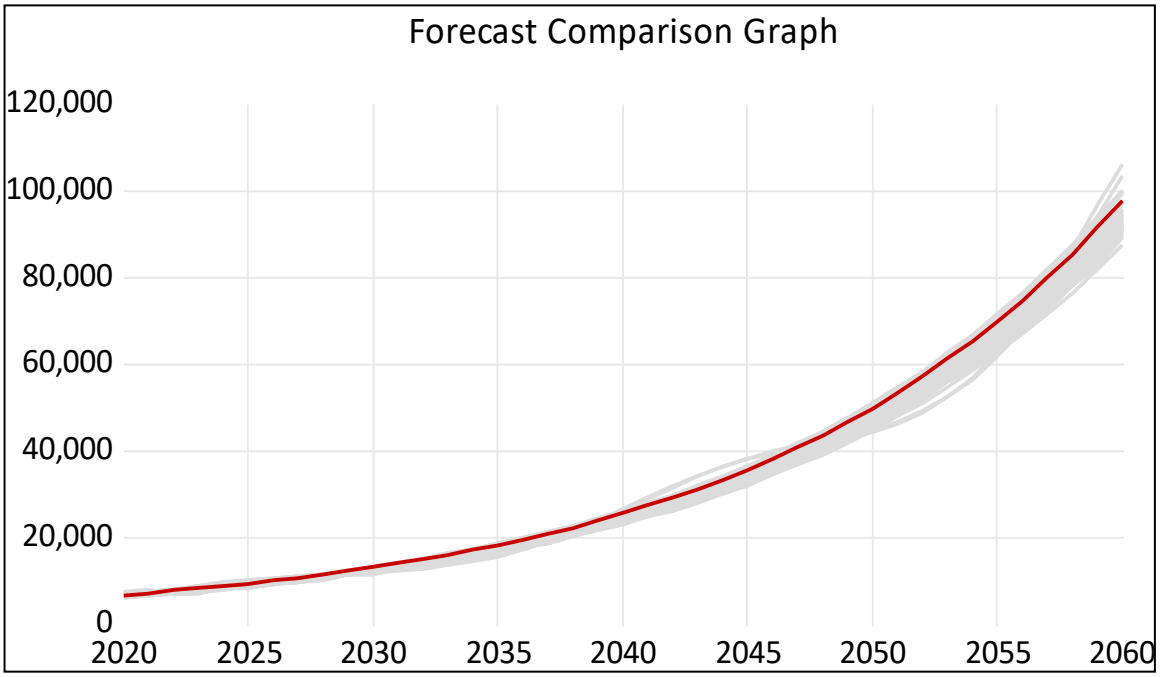
Automatic ARIMA Forecasting
Selected dependent variable: DLOG(ELEGEN)
Date: 01/17/23 Time: 14:36
Sample: 1990 2060 IF YEAR<=2019
Included observations: 29
Forecast Length: 41
Model maximums: (4,4)2(1,1)
Regressors: C
Number of estimated ARMA models: 100
Number of non-converged estimations: 0
Selected ARMA model: (0,0) (0,0)
AIC value: -1.97036422196

Model Selection Criteria Table				
Dependent Variable: DLOG(ELEGEN)				
Date: 01/17/23 Time: 14:36				
Sample: 1990 2060 IF YEAR<=2019				
Included observations: 29				
Model	LogL	AIC*	BIC	HQ
(0,0) (0,0)	30.57028	-1.97036	-1.876068	-1.940832
(3,3) (0,1)	37.33067	-1.95384	-1.529506	-1.820944
(1,1)(0,0)	31.97603	-1.92938	-1.740789	-1.870317
(0,0)(1,1)	31.97603	-1.92938	-1.740789	-1.870317
(0,1)(1,0)	31.97603	-1.92938	-1.740789	-1.870317
(1,0)(0,1)	31.7769	-1.91565	-1.727055	-1.856583
(0,4)(0,0)	33.61755	-1.90466	-1.62177	-1.816061
(0,3)(0,1)	33.61755	-1.90466	-1.62177	-1.816061

(0,1)(0,0)	30.61206	-1.90428	-1.762835	-1.859981
(0,0)(0,1)	30.61206	-1.90428	-1.762835	-1.859981
(1,0)(0,0)	30.59853	-1.90335	-1.761903	-1.859048
(0,0)(1,0)	30.59853	-1.90335	-1.761903	-1.859048
(2,1)(0,1)	33.57724	-1.90188	-1.61899	-1.813281
(2,2)(0,0)	33.57724	-1.90188	-1.61899	-1.813281
(0,1)(0,1)	31.34496	-1.88586	-1.697267	-1.826794
(0,2)(0,0)	31.34496	-1.88586	-1.697267	-1.826794
(0,1)(1,1)	32.31562	-1.88384	-1.648095	-1.810005
(1,1)(0,1)	32.31562	-1.88384	-1.648095	-1.810005
(0,2)(1,0)	32.31562	-1.88384	-1.648095	-1.810005
(1,2)(0,0)	32.31562	-1.88384	-1.648095	-1.810005
(2,0)(0,1)	32.29807	-1.88263	-1.646885	-1.808795
(2,1)(0,0)	32.29807	-1.88263	-1.646885	-1.808795
(1,0)(1,1)	32.29739	-1.88258	-1.646838	-1.808748
(1,1)(1,0)	32.29739	-1.88258	-1.646838	-1.808748
(2,0)(0,0)	30.974	-1.86028	-1.671683	-1.801211
(0,4)(1,0)	33.7223	-1.84292	-1.512881	-1.739554
(1,4)(0,0)	33.7223	-1.84292	-1.512881	-1.739554
(4,0)(0,1)	33.68944	-1.84065	-1.510614	-1.737288
(0,4)(0,1)	33.675	-1.83966	-1.509618	-1.736292
(0,3)(0,0)	31.64648	-1.83769	-1.601947	-1.763857
(1,0)(1,0)	30.60105	-1.83456	-1.645963	-1.77549
(3,2)(0,0)	33.58109	-1.83318	-1.503142	-1.729815
(2,2)(1,0)	33.58109	-1.83318	-1.503142	-1.729815
(3,1)(0,1)	33.58109	-1.83318	-1.503142	-1.729815
(2,3)(0,0)	33.5794	-1.83306	-1.503025	-1.729698
(1,2)(1,1)	33.5794	-1.83306	-1.503025	-1.729698
(1,3)(1,0)	33.5794	-1.83306	-1.503025	-1.729698
(2,2)(0,1)	33.5794	-1.83306	-1.503025	-1.729698
(0,2)(0,1)	31.48988	-1.82689	-1.591147	-1.753057

(1,2)(0,1)	32.3935	-1.82024	-1.537352	-1.731644
(3,3)(0,0)	34.36011	-1.81794	-1.440753	-1.699809
(1,3)(0,0)	32.33305	-1.81607	-1.533184	-1.727475
(0,3)(1,0)	32.33305	-1.81607	-1.533184	-1.727475
(0,2)(1,1)	32.33305	-1.81607	-1.533184	-1.727475
(3,0)(0,1)	32.30703	-1.81428	-1.531389	-1.725681
(3,1)(0,0)	32.30703	-1.81428	-1.531389	-1.725681
(1,2)(1,0)	32.29765	-1.81363	-1.530742	-1.725034
(2,0)(1,1)	32.23697	-1.80945	-1.526557	-1.720849
(2,1)(1,0)	32.23697	-1.80945	-1.526557	-1.720849
(2,1)(1,1)	33.18556	-1.8059	-1.475864	-1.702537
(3,4)(0,0)	35.16422	-1.80443	-1.380096	-1.671533
(2,3)(1,1)	35.15238	-1.80361	-1.379279	-1.670717
(1,1)(1,1)	32.08999	-1.79931	-1.51642	-1.710712
(4,0)(1,1)	34.06797	-1.79779	-1.420606	-1.679662
(4,1)(1,0)	34.06797	-1.79779	-1.420606	-1.679662
(2,4)(0,0)	34.0373	-1.79568	-1.418491	-1.677546
(2,0)(1,0)	30.97835	-1.79161	-1.55587	-1.717779
(3,0)(0,0)	30.97835	-1.79161	-1.55587	-1.717779
(4,1)(0,1)	33.95303	-1.78986	-1.412679	-1.671734
(4,2)(0,0)	33.95303	-1.78986	-1.412679	-1.671734
(3,2)(1,0)	33.85562	-1.78315	-1.405961	-1.665017
(1,3)(1,1)	33.79669	-1.77908	-1.401897	-1.660953
(1,4)(1,0)	33.79669	-1.77908	-1.401897	-1.660953
(2,3)(0,1)	33.79668	-1.77908	-1.401897	-1.660952
(1,4)(0,1)	33.73217	-1.77463	-1.397448	-1.656503
(2,3)(1,0)	33.63224	-1.76774	-1.390555	-1.649611
(2,2)(1,1)	33.63224	-1.76774	-1.390555	-1.649611
(4,3)(0,0)	34.5233	-1.76023	-1.335894	-1.627332
(4,2)(0,1)	34.5233	-1.76023	-1.335894	-1.627332
(4,4)(0,0)	35.45201	-1.75531	-1.28383	-1.607649

(4,0)(0,0)	31.42808	-1.75366	-1.470772	-1.665063
(4,1)(0,0)	32.42412	-1.75339	-1.423351	-1.650024
(4,1)(1,1)	34.42376	-1.75336	-1.32903	-1.620467
(3,4)(0,1)	35.41547	-1.75279	-1.28131	-1.605129
(0,3)(1,1)	32.34178	-1.74771	-1.417672	-1.644345
(1,3)(0,1)	32.33825	-1.74747	-1.417428	-1.644102
(3,1)(1,0)	32.32611	-1.74663	-1.416591	-1.643265
(3,0)(1,1)	32.32611	-1.74663	-1.416591	-1.643265
(4,0)(1,0)	32.3148	-1.74585	-1.415811	-1.642485
(3,4)(1,0)	35.17519	-1.73622	-1.264738	-1.588558
(1,4)(1,1)	34.09819	-1.73091	-1.306576	-1.598014
(4,2)(1,0)	34.06949	-1.72893	-1.304597	-1.596034
(2,4)(1,1)	35.03566	-1.7266	-1.255116	-1.578935
(3,0)(1,0)	30.98238	-1.72292	-1.440034	-1.634325
(4,2)(1,1)	34.92015	-1.71863	-1.24715	-1.570969
(2,4)(0,1)	33.91516	-1.71829	-1.293953	-1.585391
(2,4)(1,0)	33.88031	-1.71588	-1.291551	-1.582988
(3,2)(1,1)	33.7828	-1.70916	-1.284825	-1.576263
(3,3)(1,1)	34.67334	-1.70161	-1.230129	-1.553948
(4,3)(0,1)	34.67334	-1.70161	-1.230129	-1.553948
(3,1)(1,1)	32.61875	-1.69784	-1.320659	-1.579715
(3,4)(1,1)	35.45478	-1.68654	-1.167907	-1.524108
(3,2)(0,1)	32.35992	-1.67999	-1.302809	-1.561865
(4,4)(0,1)	35.27677	-1.67426	-1.155631	-1.511832
(4,3)(1,0)	34.23296	-1.67124	-1.199758	-1.523577
(4,4)(1,0)	35.21753	-1.67018	-1.151545	-1.507746
(4,4)(1,1)	36.16766	-1.66674	-1.100958	-1.489541
(3,3)(1,0)	33.10621	-1.6625	-1.238164	-1.529602
(4,3)(1,1)	34.55949	-1.62479	-1.106163	-1.462364
(0,4)(1,1)	29.1991	-1.46201	-1.084822	-1.343877


Forecast Comparison Graph
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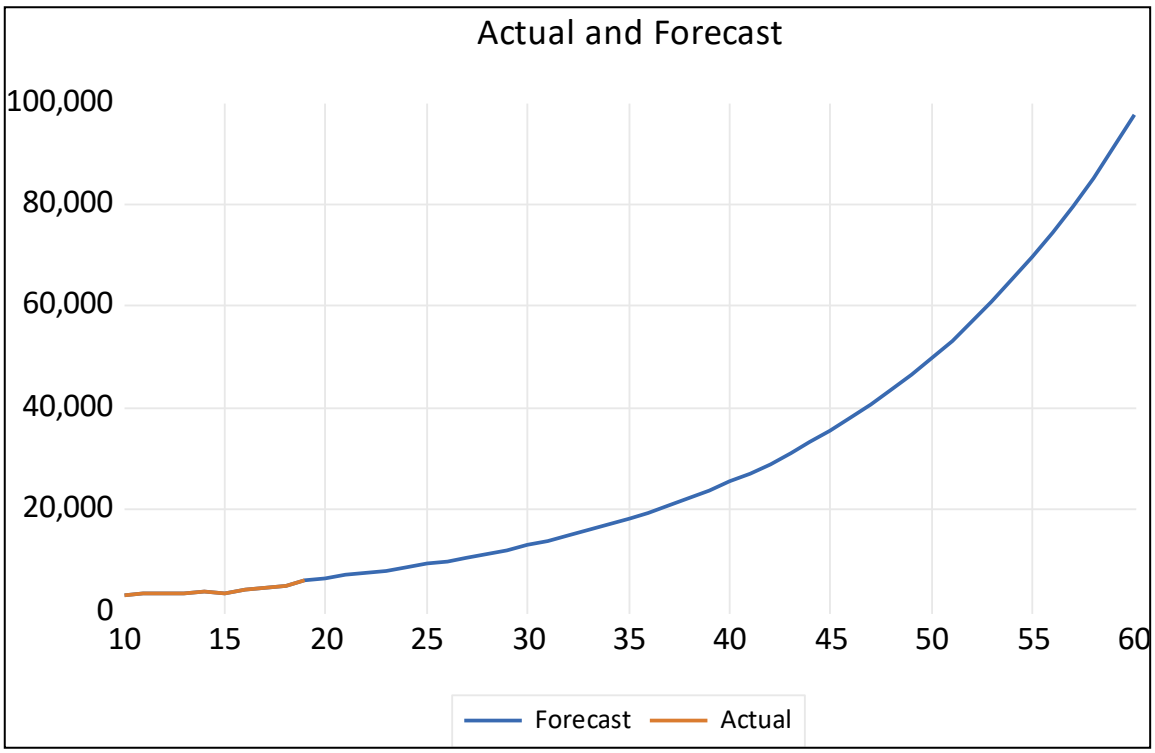
Actual and Forecast
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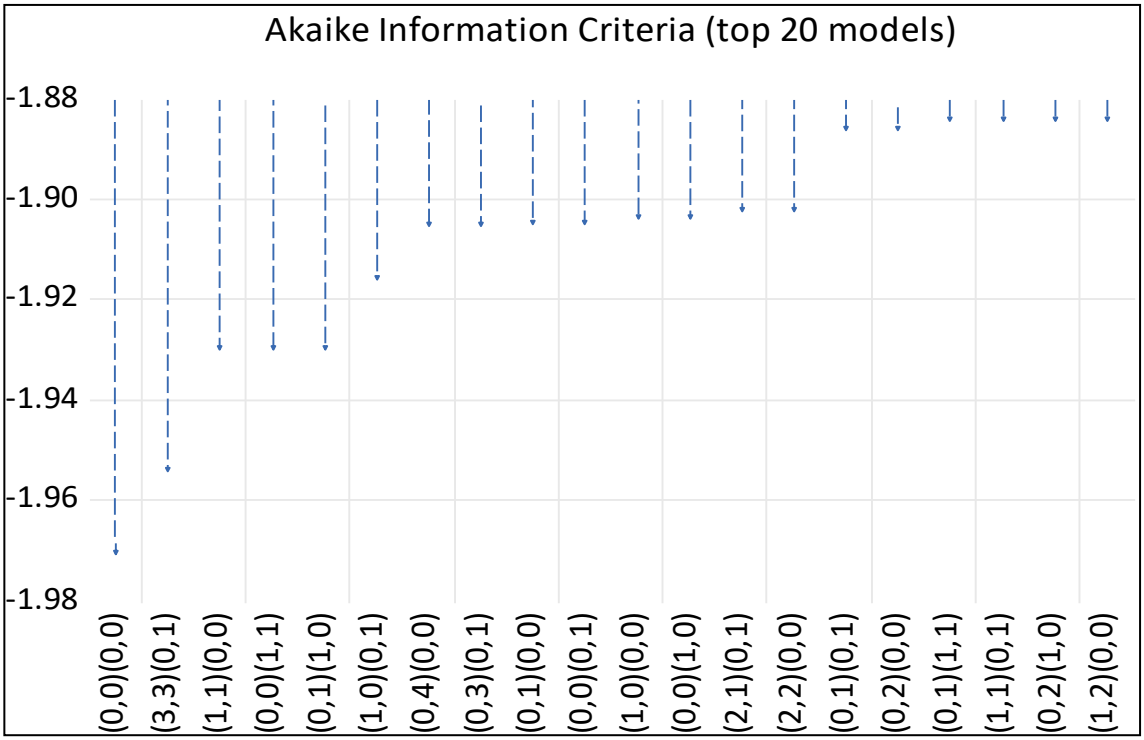
Forecast
Actual



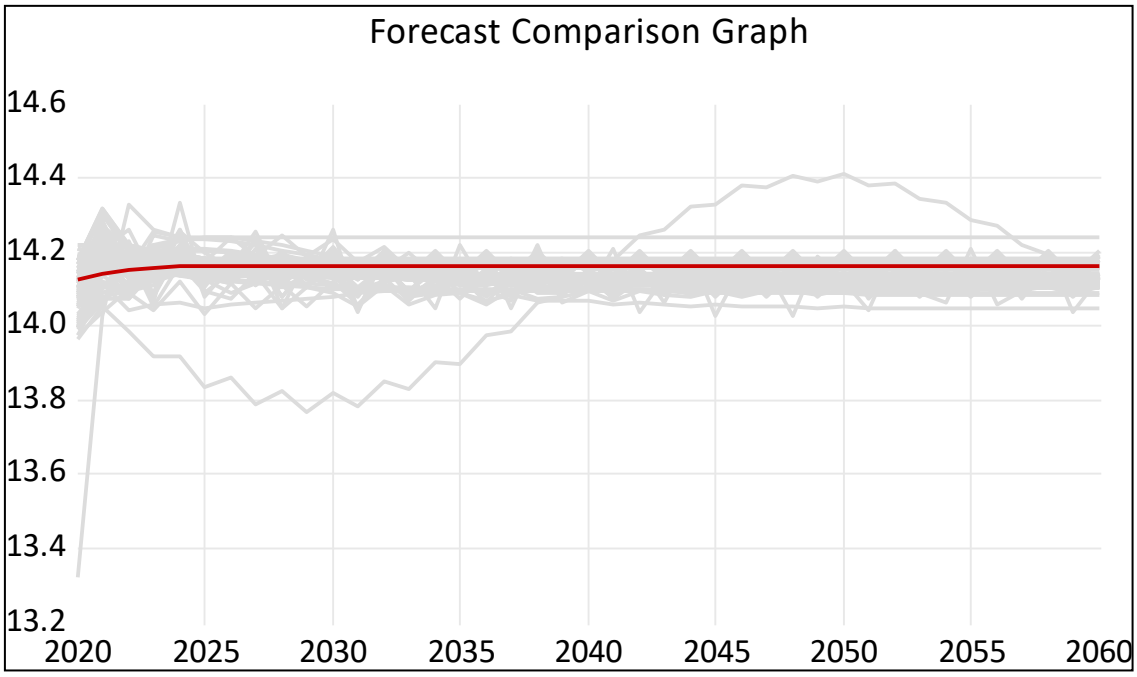
Scenario 2 Mean Temperature

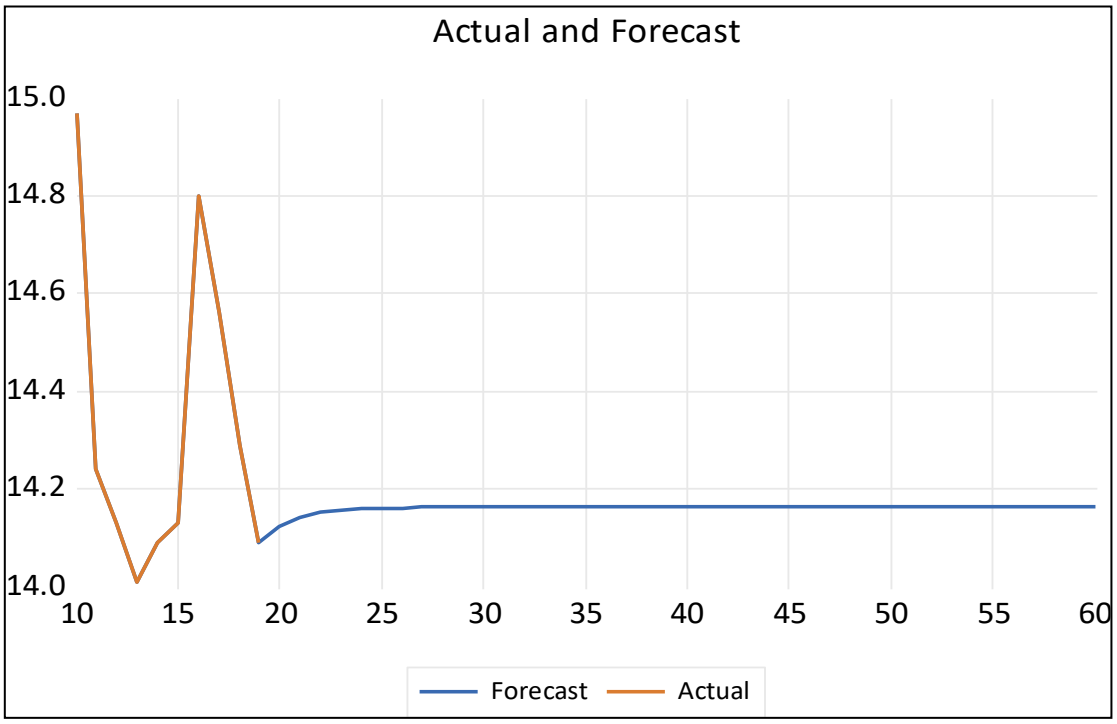
Automatic ARIMA Forecasting
Selected dependent variable: LOG(MEANTEMP)
Date: 01/17/23 Time: 14:41
Sample: 1990 2060 IF YEAR<=2019
Included observations: 30
Forecast Length: 41
Model maximums: (4,4)2(1,1)
Regressors: C
Number of estimated ARMA models: 100
Number of non-converged estimations: 0
Selected ARMA model: (1,0)(0,0)
AIC value: -4.3142627928

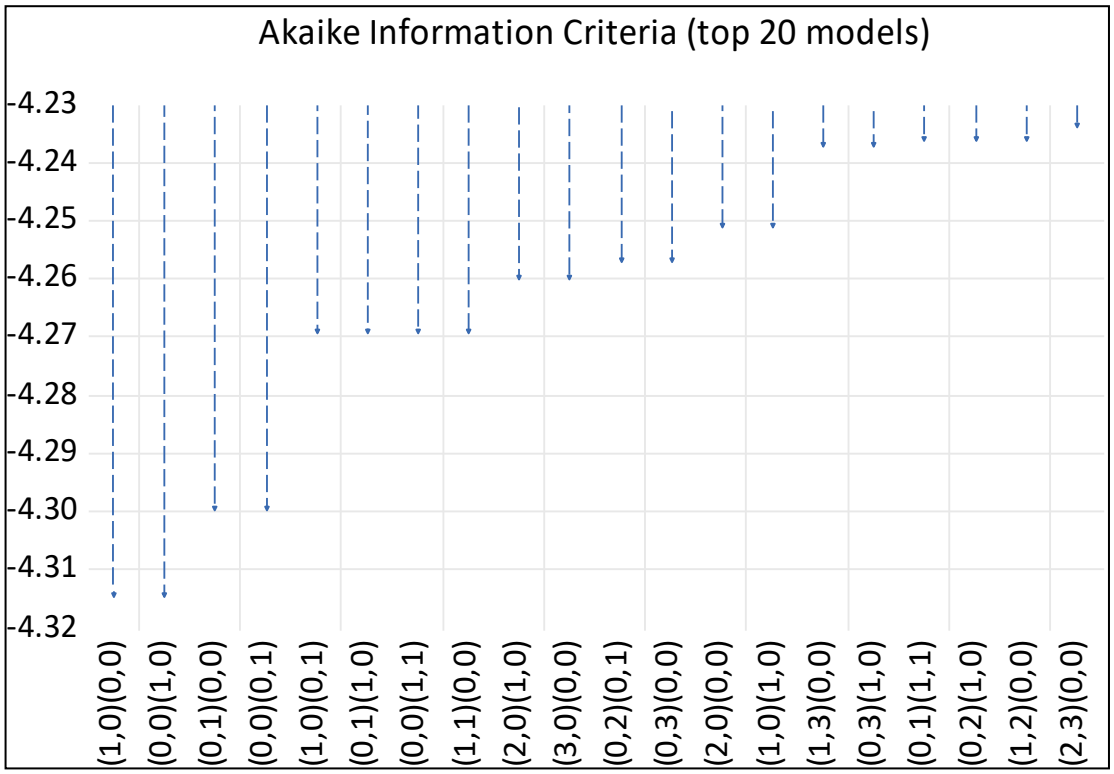
Model Selection Criteria Table				
Dependent Variable: LOG(MEANTEMP)				
Date: 01/17/23 Time: 14:41				
Sample: 1990 2060 IF YEAR<=2019				
Included observations: 30				
Model	LogL	AIC*	BIC	HQ
(1,0)(0,0)	67.71394	-4.31426	-4.17414	-4.26944
(0,0)(1,0)	67.71394	-4.31426	-4.17414	-4.26944
(0,1)(0,0)	67.48847	-4.29923	-4.15911	-4.25441
(0,0)(0,1)	67.48847	-4.29923	-4.15911	-4.25441
(1,0)(0,1)	68.03105	-4.26874	-4.08191	-4.20897
(0,1)(1,0)	68.03105	-4.26874	-4.08191	-4.20897
(0,0)(1,1)	68.03105	-4.26874	-4.08191	-4.20897
(1,1)(0,0)	68.03105	-4.26874	-4.08191	-4.20897
(2,0)(1,0)	68.89352	-4.25957	-4.02604	-4.18486
(3,0)(0,0)	68.89352	-4.25957	-4.02604	-4.18486
(0,2)(0,1)	68.84837	-4.25656	-4.02303	-4.18185
(0,3)(0,0)	68.84837	-4.25656	-4.02303	-4.18185
(2,0)(0,0)	67.75805	-4.25054	-4.06371	-4.19077
(1,0)(1,0)	67.75805	-4.25054	-4.06371	-4.19077
(1,3)(0,0)	69.5536	-4.23691	-3.95667	-4.14726
(0,3)(1,0)	69.5536	-4.23691	-3.95667	-4.14726
(0,1)(1,1)	68.5388	-4.23592	-4.00239	-4.16121
(0,2)(1,0)	68.5388	-4.23592	-4.00239	-4.16121
(1,2)(0,0)	68.5388	-4.23592	-4.00239	-4.16121
(2,3)(0,0)	70.50423	-4.23362	-3.90667	-4.12902
(0,1)(0,1)	67.48906	-4.2326	-4.04578	-4.17284
(0,2)(0,0)	67.48906	-4.2326	-4.04578	-4.17284
(3,1)(0,0)	69.42182	-4.22812	-3.94788	-4.13847
(2,1)(1,0)	69.42182	-4.22812	-3.94788	-4.13847
(3,0)(0,1)	69.42182	-4.22812	-3.94788	-4.13847
(2,2)(0,0)	69.39872	-4.22658	-3.94634	-4.13693
(2,1)(0,1)	69.39872	-4.22658	-3.94634	-4.13693
(1,1)(1,1)	69.39872	-4.22658	-3.94634	-4.13693
(1,2)(1,0)	69.39872	-4.22658	-3.94634	-4.13693
(1,2)(0,1)	69.34739	-4.22316	-3.94292	-4.13351
(0,2)(1,1)	69.34739	-4.22316	-3.94292	-4.13351
(2,0)(0,1)	68.34487	-4.22299	-3.98946	-4.14828
(2,1)(0,0)	68.25334	-4.21689	-3.98336	-4.14218
(1,1)(1,0)	68.25334	-4.21689	-3.98336	-4.14218
(1,0)(1,1)	68.25334	-4.21689	-3.98336	-4.14218

(1,3)(1,0)	70.22988	-4.21533	-3.88838	-4.11073
(0,4)(1,0)	69.98592	-4.19906	-3.87212	-4.09447
(3,0)(1,0)	68.9491	-4.19661	-3.91637	-4.10696
(4,0)(0,0)	68.9491	-4.19661	-3.91637	-4.10696
(0,4)(0,0)	68.89165	-4.19278	-3.91254	-4.10313
(0,3)(1,1)	69.67554	-4.17837	-3.85142	-4.07378
(1,1)(0,1)	67.63402	-4.1756	-3.94207	-4.10089
(3,2)(0,0)	69.55685	-4.17046	-3.84351	-4.06586
(3,1)(0,1)	69.55685	-4.17046	-3.84351	-4.06586
(2,2)(1,0)	69.55685	-4.17046	-3.84351	-4.06586
(1,3)(0,1)	69.55487	-4.17033	-3.84338	-4.06573
(1,4)(0,0)	69.55487	-4.17033	-3.84338	-4.06573
(1,2)(1,1)	69.53724	-4.16915	-3.8422	-4.06456
(2,2)(0,1)	69.53724	-4.16915	-3.8422	-4.06456
(2,1)(1,1)	69.42864	-4.16191	-3.83496	-4.05732
(4,1)(0,0)	69.42371	-4.16158	-3.83464	-4.05699
(3,0)(1,1)	69.42371	-4.16158	-3.83464	-4.05699
(3,1)(1,0)	69.42371	-4.16158	-3.83464	-4.05699
(4,0)(0,1)	69.42371	-4.16158	-3.83464	-4.05699
(2,0)(1,1)	68.29116	-4.15274	-3.8725	-4.06309
(4,3)(0,1)	72.28699	-4.15247	-3.6854	-4.00305
(2,3)(1,0)	70.28558	-4.15237	-3.77872	-4.03284
(4,0)(1,0)	68.99379	-4.13292	-3.80597	-4.02833
(3,3)(0,1)	70.94829	-4.12989	-3.70953	-3.99541
(3,3)(1,0)	70.93238	-4.12883	-3.70847	-3.99435
(0,4)(0,1)	68.90826	-4.12722	-3.80027	-4.02263
(4,1)(0,1)	69.76338	-4.11756	-3.74391	-3.99802
(2,2)(1,1)	69.71311	-4.11421	-3.74056	-3.99467
(3,2)(0,1)	69.66632	-4.11109	-3.73744	-3.99155
(3,3)(0,0)	69.63998	-4.10933	-3.73568	-3.9898
(4,4)(1,0)	72.59334	-4.10622	-3.59245	-3.94186
(4,2)(0,0)	69.58862	-4.10591	-3.73226	-3.98637
(3,2)(1,0)	69.58862	-4.10591	-3.73226	-3.98637
(2,4)(0,0)	69.56113	-4.10408	-3.73042	-3.98454
(1,4)(1,0)	69.56113	-4.10408	-3.73042	-3.98454
(1,4)(0,1)	69.54307	-4.10287	-3.72922	-3.98334
(0,4)(1,1)	69.54307	-4.10287	-3.72922	-3.98334
(1,3)(1,1)	69.53814	-4.10254	-3.72889	-3.98301
(3,1)(1,1)	69.45017	-4.09668	-3.72303	-3.97714
(4,0)(1,1)	69.42491	-4.09499	-3.72134	-3.97546
(2,3)(1,1)	70.35083	-4.09006	-3.6697	-3.95558
(1,4)(1,1)	70.27815	-4.08521	-3.66485	-3.95073
(3,3)(1,1)	71.18211	-4.07881	-3.61174	-3.92939

(0,0)(0,0)	63.11792	-4.07453	-3.98112	-4.04464
(2,4)(0,1)	70.02417	-4.06828	-3.64792	-3.9338
(4,4)(0,1)	72.00428	-4.06695	-3.55318	-3.90259
(3,4)(1,0)	71.00101	-4.06673	-3.59967	-3.91732
(4,1)(1,0)	68.9491	-4.06327	-3.68962	-3.94374
(3,2)(1,1)	69.88178	-4.05879	-3.63843	-3.92431
(4,2)(1,1)	70.8106	-4.05404	-3.58697	-3.90462
(4,3)(1,0)	70.75562	-4.05038	-3.58331	-3.90096
(4,2)(0,1)	69.69391	-4.04626	-3.6259	-3.91178
(4,2)(1,0)	69.61359	-4.04091	-3.62055	-3.90643
(4,1)(1,1)	69.61359	-4.04091	-3.62055	-3.90643
(3,4)(0,1)	70.43882	-4.02925	-3.56219	-3.87984
(3,4)(0,0)	69.3274	-4.02183	-3.60147	-3.88735
(4,4)(0,0)	70.18408	-4.01227	-3.54521	-3.86285
(3,4)(1,1)	71.16411	-4.01094	-3.49717	-3.84658
(2,3)(0,1)	68.02895	-4.00193	-3.62828	-3.8824
(4,3)(0,0)	68.92476	-3.99498	-3.57463	-3.86051
(4,3)(1,1)	70.81284	-3.98752	-3.47375	-3.82316
(2,4)(1,1)	68.74793	-3.91653	-3.44946	-3.76711
(4,4)(1,1)	70.51351	-3.9009	-3.34042	-3.7216
(2,4)(1,0)	67.35438	-3.89029	-3.46993	-3.75582
(0,3)(0,1)	52.36336	-3.09089	-2.81065	-3.00124




Actual and Forecast
15.0
14.8
14.6
14.4
14.2
14.0
10
15
20
25
30
35
40
45
50
55
60
Forecast
Actual


Akaike Information Criteria (top 20 models)
-4.23
-4.24
-4.25
-4.26
-4.27
-4.28
-4.29
-4.30
-4.31
-4.32
(1,0)(0,0)
(0,0)(1,0)
(0,1)(0,0)
(0,0)(0,1)
(1,0)(0,1)
(0,1)(1,0)
(0,0)(1,1)
(1,1)(0,0)
(2,0)(1,0)
(3,0)(0,0)
(0,2)(0,1)
(0,3)(0,0)
(2,0)(0,0)
(1,0)(1,0)
(1,3)(0,0)
(0,3)(1,0)
(0,1)(1,1)
(0,2)(1,0)
(1,2)(0,0)
(2,3)(0,0)

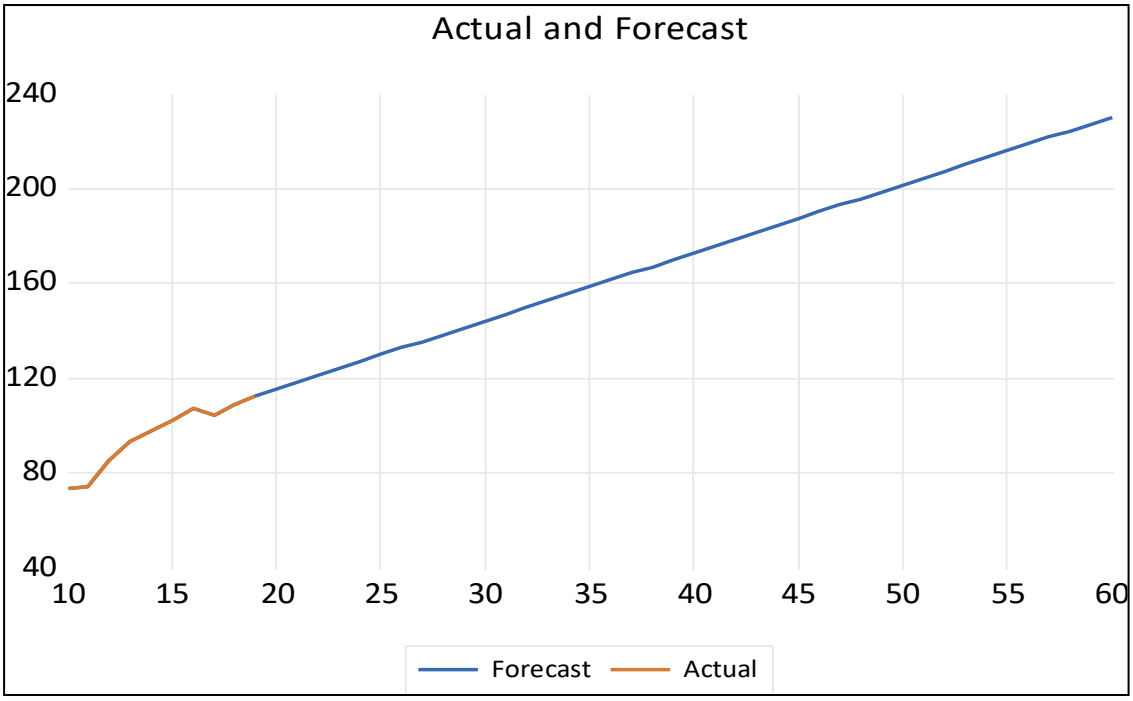
Scenario 3 Foreign Exchange rate

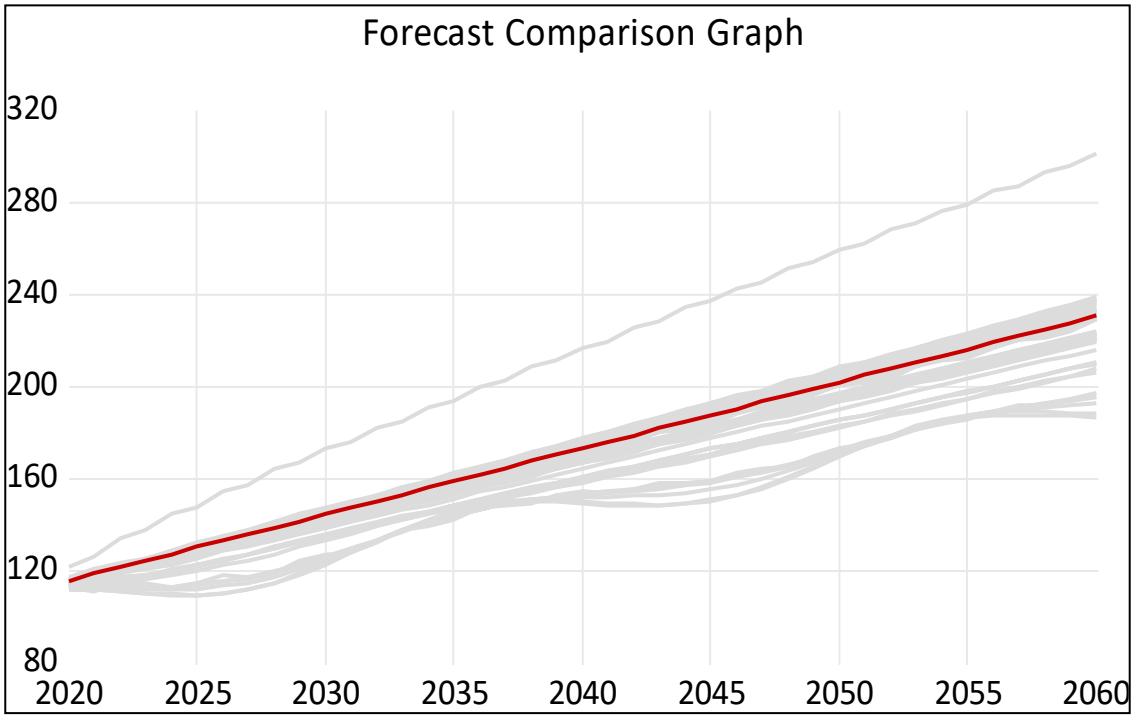
Automatic ARIMA Forecasting
Selected dependent variable: D(EXCHANGE)
Date: 01/17/23 Time: 13:19
Sample: 1990 2060 IF YEAR<=2019
Included observations: 29
Forecast Length: 41
Model maximums: (4,4)2(1,1)
Regressors: C
Number of estimated ARMA models: 100
Number of non-converged estimations: 0
Selected ARMA model: (0,0)(0,0)
AIC value: 5.7493530828

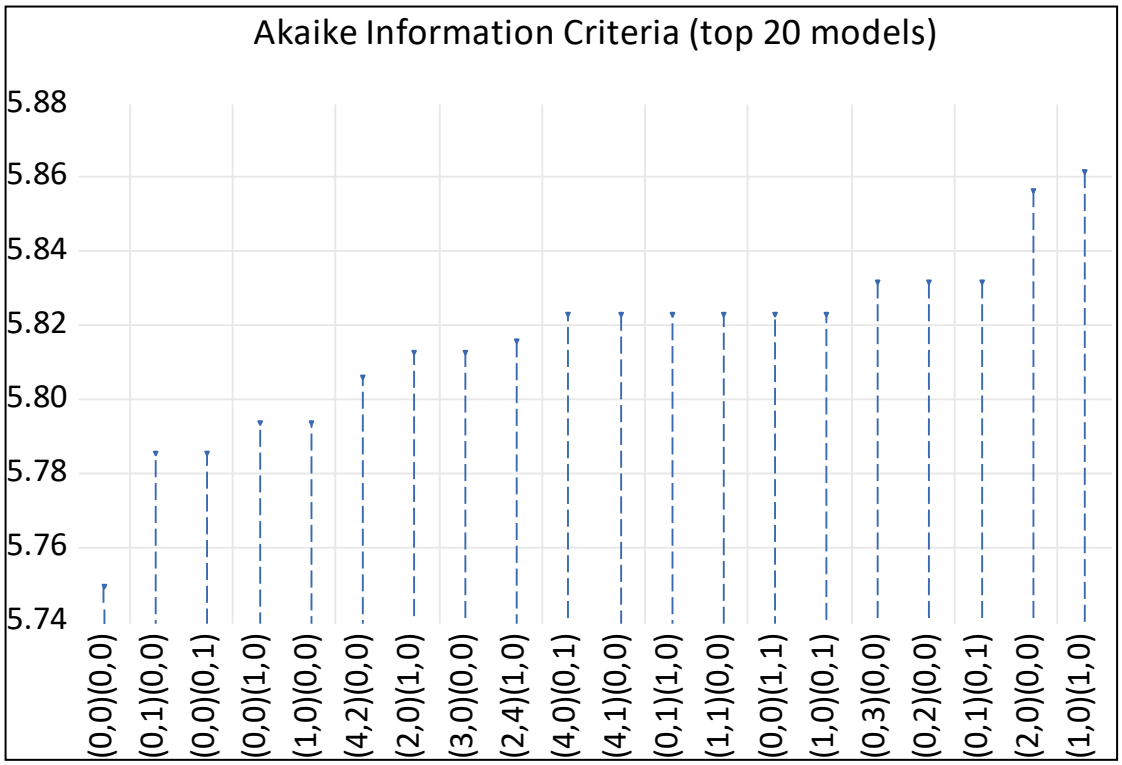
Model Selection Criteria Table				
Dependent Variable: D(EXCHANGE)				
Date: 01/17/23 Time: 13:19				
Sample: 1990 2060 IF YEAR<=2019				
Included observations: 29				
Model	LogL	AIC*	BIC	HQ
(0,0)(0,0)	-81.3656	5.749353	5.843649	5.778885
(0,1)(0,0)	-80.8906	5.785557	5.927001	5.829856
(0,0)(0,1)	-80.8906	5.785557	5.927001	5.829856
(0,0)(1,0)	-81.0129	5.79399	5.935435	5.838289
(1,0)(0,0)	-81.0129	5.79399	5.935435	5.838289
(4,2)(0,0)	-76.189	5.806137	6.183322	5.924266
(2,0)(1,0)	-79.2889	5.813031	6.048772	5.886862
(3,0)(0,0)	-79.2889	5.813031	6.048772	5.886862
(2,4)(1,0)	-75.3344	5.816167	6.2405	5.949063
(4,0)(0,1)	-77.4352	5.823114	6.153151	5.926478
(4,1)(0,0)	-77.4352	5.823114	6.153151	5.926478
(0,1)(1,0)	-80.4357	5.823154	6.011746	5.882219
(1,1)(0,0)	-80.4357	5.823154	6.011746	5.882219
(0,0)(1,1)	-80.4357	5.823154	6.011746	5.882219
(1,0)(0,1)	-80.4357	5.823154	6.011746	5.882219
(0,3)(0,0)	-79.5599	5.831718	6.067459	5.905549
(0,2)(0,0)	-80.5652	5.832082	6.020674	5.891147
(0,1)(0,1)	-80.5652	5.832082	6.020674	5.891147

(2,0)(0,0)	-80.9216	5.856664	6.045257	5.915729
(1,0)(1,0)	-80.9987	5.861977	6.05057	5.921042
(4,1)(1,0)	-77.1417	5.871841	6.249026	5.989971
(2,2)(0,1)	-78.1596	5.873077	6.203113	5.97644
(4,4)(0,0)	-75.1944	5.875473	6.346954	6.023135
(4,0)(0,0)	-79.2128	5.876743	6.159632	5.965341
(3,0)(1,0)	-79.2128	5.876743	6.159632	5.965341
(3,1)(0,0)	-79.2563	5.879742	6.16263	5.968339
(3,0)(0,1)	-79.2563	5.879742	6.16263	5.968339
(2,1)(1,0)	-79.2563	5.879742	6.16263	5.968339
(4,2)(0,1)	-76.279	5.881314	6.305647	6.014209
(4,1)(1,1)	-76.2798	5.881368	6.305701	6.014264
(0,4)(0,0)	-79.2825	5.88155	6.164439	5.970147
(0,3)(0,1)	-79.3044	5.883065	6.165953	5.971662
(3,2)(0,0)	-78.3317	5.884945	6.214982	5.988308
(1,4)(0,0)	-78.3574	5.886715	6.216752	5.990079
(0,4)(1,0)	-78.3574	5.886715	6.216752	5.990079
(2,0)(0,1)	-80.371	5.887658	6.123399	5.961489
(1,1)(1,0)	-80.3827	5.888459	6.1242	5.96229
(1,0)(1,1)	-80.3827	5.888459	6.1242	5.96229
(0,1)(1,1)	-80.4048	5.889989	6.12573	5.96382
(1,1)(0,1)	-80.4048	5.889989	6.12573	5.96382
(0,2)(1,0)	-80.4048	5.889989	6.12573	5.96382
(1,2)(0,0)	-80.4048	5.889989	6.12573	5.96382
(2,3)(0,0)	-78.4331	5.89194	6.221977	5.995304
(1,3)(0,0)	-79.4468	5.892885	6.175774	5.981483
(0,2)(0,1)	-80.4977	5.896393	6.132134	5.970224
(2,2)(0,0)	-79.9051	5.92449	6.207379	6.013088
(4,0)(1,0)	-78.9358	5.926607	6.256644	6.029971
(2,4)(0,0)	-77.9388	5.926816	6.304001	6.044946
(2,1)(0,0)	-80.9963	5.930781	6.166522	6.004612
(0,4)(0,1)	-79.0303	5.933125	6.263162	6.036488
(0,3)(1,0)	-80.0478	5.93433	6.217219	6.022927
(3,0)(1,1)	-79.116	5.939032	6.269069	6.042396
(3,1)(1,0)	-79.116	5.939032	6.269069	6.042396
(2,1)(1,1)	-79.251	5.948347	6.278384	6.051711
(3,1)(0,1)	-79.251	5.948347	6.278384	6.051711
(4,3)(0,0)	-77.2634	5.949197	6.373531	6.082093
(2,1)(0,1)	-80.2653	5.949328	6.232217	6.037925
(1,3)(0,1)	-79.2978	5.951575	6.281612	6.054938
(0,4)(1,1)	-78.2994	5.951683	6.328868	6.069812
(2,3)(1,0)	-78.3025	5.951895	6.32908	6.070025
(3,2)(0,1)	-78.3025	5.951895	6.32908	6.070025

(4,0)(1,1)	-78.3153	5.952782	6.329968	6.070912
(1,1)(1,1)	-80.3817	5.95736	6.240249	6.045957
(1,2)(1,0)	-80.3817	5.95736	6.240249	6.045957
(1,2)(0,1)	-80.4007	5.95867	6.241559	6.047268
(0,2)(1,1)	-80.4097	5.959287	6.242176	6.047885
(3,3)(0,1)	-77.6905	5.978655	6.402989	6.111551
(3,4)(0,0)	-77.7534	5.982994	6.407327	6.11589
(1,3)(1,0)	-79.9038	5.993362	6.323399	6.096726
(4,1)(0,1)	-78.9598	5.99723	6.374415	6.115359
(1,4)(0,1)	-78.9653	5.997609	6.374795	6.115739
(2,0)(1,1)	-80.9878	5.999161	6.28205	6.087758
(3,1)(1,1)	-79.0849	6.005854	6.383039	6.123984
(2,4)(0,1)	-78.1404	6.009684	6.434017	6.14258
(1,2)(1,1)	-80.16	6.011033	6.34107	6.114397
(2,2)(1,0)	-80.2194	6.01513	6.345167	6.118494
(4,2)(1,0)	-78.2949	6.020337	6.44467	6.153233
(3,3)(1,0)	-78.2956	6.020384	6.444718	6.15328
(1,3)(1,1)	-79.2965	6.020445	6.39763	6.138575
(3,3)(0,0)	-79.3052	6.021047	6.398232	6.139177
(4,3)(1,0)	-77.3527	6.024324	6.495805	6.171986
(3,2)(1,1)	-78.3844	6.026513	6.450846	6.159409
(2,3)(1,1)	-78.4847	6.03343	6.457763	6.166326
(1,4)(1,0)	-79.5233	6.036088	6.413273	6.154218
(2,3)(0,1)	-79.567	6.0391	6.416285	6.15723
(1,4)(1,1)	-78.8097	6.055839	6.480173	6.188735
(3,2)(1,0)	-79.8122	6.056012	6.433197	6.174142
(2,2)(1,1)	-80.0882	6.075047	6.452232	6.193176
(2,4)(1,1)	-78.128	6.077791	6.549273	6.225453
(3,4)(0,1)	-78.1299	6.077926	6.549407	6.225588
(3,3)(1,1)	-78.2952	6.089326	6.560807	6.236988
(3,4)(1,0)	-78.3025	6.089826	6.561308	6.237489
(4,4)(1,0)	-77.517	6.104621	6.62325	6.267049
(4,2)(1,1)	-78.6415	6.113206	6.584688	6.260868
(3,4)(1,1)	-78.1181	6.146076	6.664705	6.308504
(4,3)(1,1)	-78.2625	6.156036	6.674666	6.318464
(4,3)(0,1)	-79.8602	6.197254	6.668735	6.344916
(4,4)(0,1)	-79.4597	6.238603	6.757232	6.401031
(0,3)(1,1)	-83.6645	6.252723	6.58276	6.356087
(4,4)(1,1)	-102.831	7.919387	8.485165	8.096581


Actual and Forecast
240
200
160
120
80
40
10
15
20
25
30
35
40
45
50
55
60
Forecast
Actual


Forecast Comparison Graph
320
280
240
200
160
120
80
2020
2025
2030
2035
2040
2045
2050
2055
2060



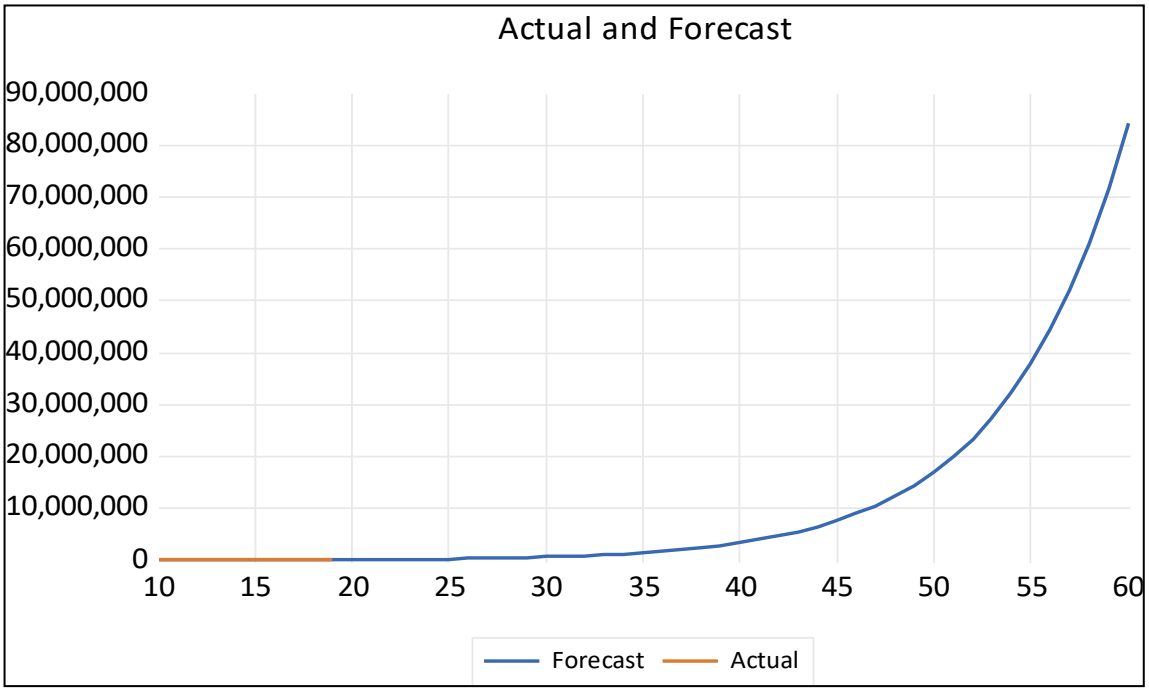
Scenario 4 Import of Agricultural Food Products

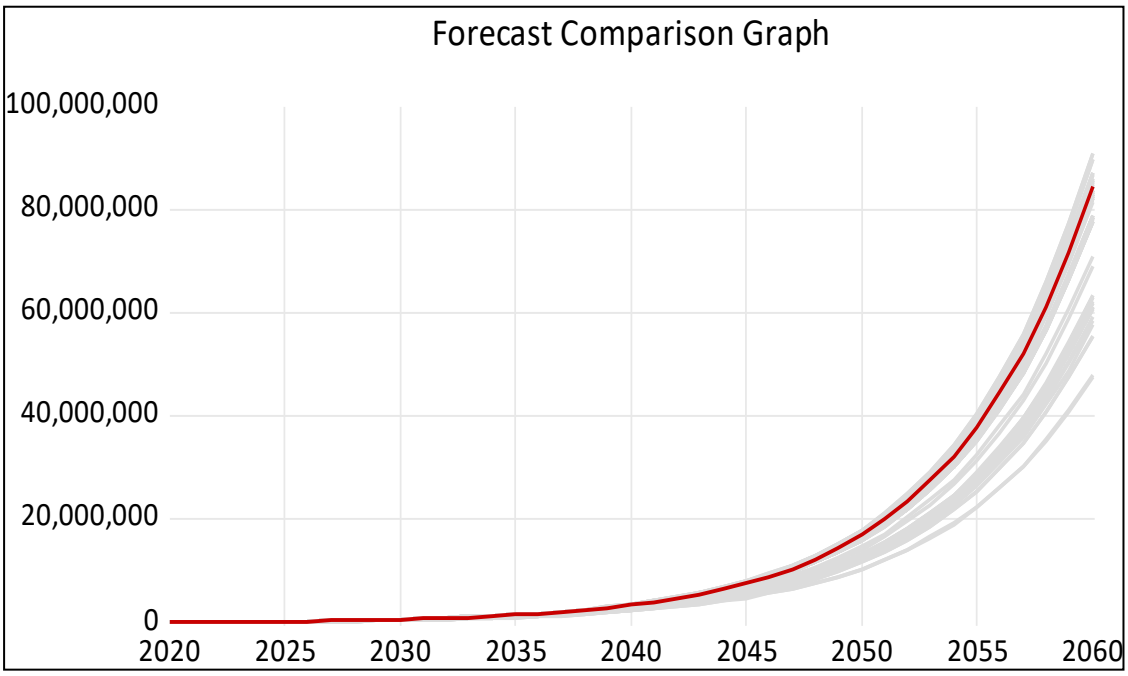
Automatic ARIMA Forecasting
Selected dependent variable: DLOG(AGRIIMPORT)
Date: 01/17/23 Time: 14:48
Sample: 1990 2060 IF YEAR<=2019
Included observations: 29
Forecast Length: 41
Model maximums: (4,4)2(1,1)
Regressors: C
Number of estimated ARMA models: 100
Number of non-converged estimations: 0
Selected ARMA model: (0,0)(0,0)
AIC value: -0.213415177905

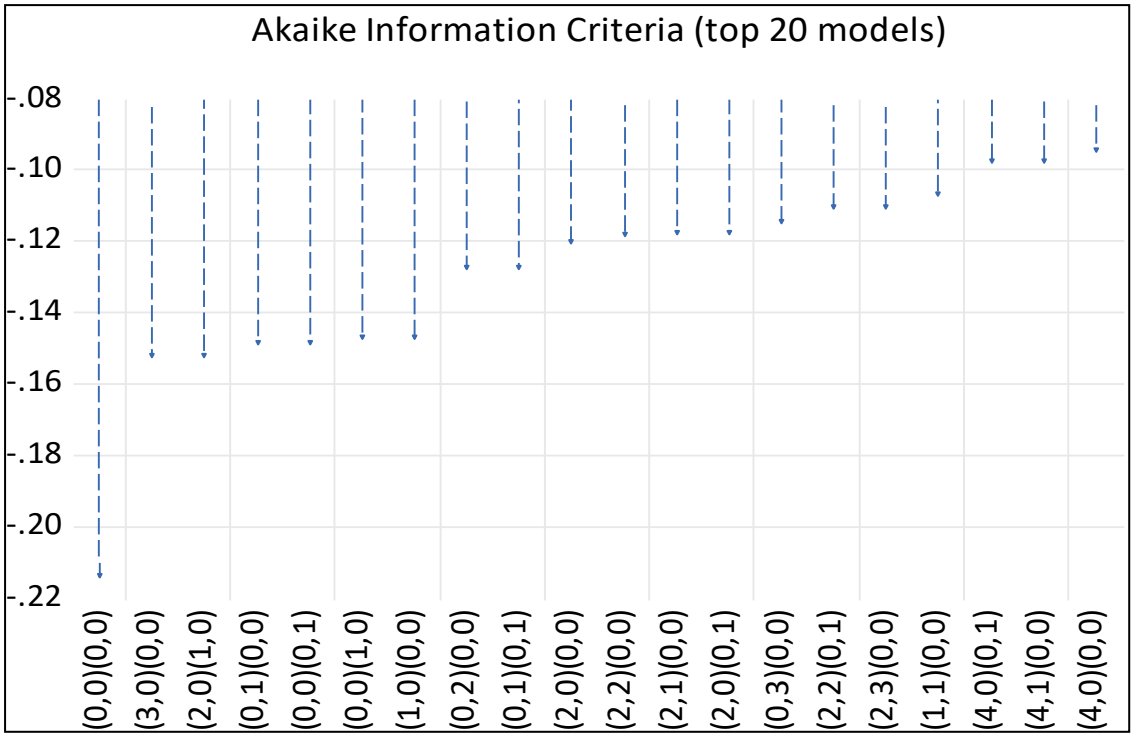
Model Selection Criteria Table				
Dependent Variable: DLOG(AGRIIMPORT)				
Date: 01/17/23 Time: 14:48				
Sample: 1990 2060 IF YEAR<=2019				
Included observations: 29				
Model	LogL	AIC*	BIC	HQ
(0,0)(0,0)	5.09452	-0.21342	-0.11912	-0.18388
(3,0)(0,0)	7.201434	-0.15182	0.083918	-0.07799
(2,0)(1,0)	7.201434	-0.15182	0.083918	-0.07799
(0,1)(0,0)	5.145842	-0.14799	-0.00655	-0.10369
(0,0)(0,1)	5.145842	-0.14799	-0.00655	-0.10369
(0,0)(1,0)	5.128181	-0.14677	-0.00533	-0.10247
(1,0)(0,0)	5.128181	-0.14677	-0.00533	-0.10247
(0,2)(0,0)	5.846579	-0.12735	0.061242	-0.06829
(0,1)(0,1)	5.846579	-0.12735	0.061242	-0.06829
(2,0)(0,0)	5.737012	-0.11979	0.068799	-0.06073
(2,2)(0,0)	7.709008	-0.11786	0.165026	-0.02927
(2,1)(0,0)	6.703829	-0.11751	0.118235	-0.04367
(2,0)(0,1)	6.703829	-0.11751	0.118235	-0.04367
(0,3)(0,0)	6.654606	-0.11411	0.12163	-0.04028
(2,2)(0,1)	8.593509	-0.1099	0.22014	-0.00653
(2,3)(0,0)	8.593509	-0.1099	0.22014	-0.00653
(1,1)(0,0)	5.544309	-0.1065	0.082088	-0.04744
(4,0)(0,1)	8.407661	-0.09708	0.232957	0.006283
(4,1)(0,0)	8.407661	-0.09708	0.232957	0.006283
(4,0)(0,0)	7.368539	-0.09438	0.188507	-0.00579
(3,0)(1,0)	7.351881	-0.09323	0.189656	-0.00464
(2,0)(1,1)	7.3023	-0.08981	0.193075	-0.00122
(2,1)(1,0)	7.3023	-0.08981	0.193075	-0.00122
(3,1)(0,0)	7.3023	-0.08981	0.193075	-0.00122
(3,0)(0,1)	7.3023	-0.08981	0.193075	-0.00122
(0,1)(1,1)	6.24219	-0.08567	0.150072	-0.01184
(0,2)(1,0)	6.24219	-0.08567	0.150072	-0.01184
(1,1)(0,1)	6.24219	-0.08567	0.150072	-0.01184
(1,2)(0,0)	6.24219	-0.08567	0.150072	-0.01184
(0,1)(1,0)	5.189701	-0.08205	0.106544	-0.02298
(0,0)(1,1)	5.189701	-0.08205	0.106544	-0.02298
(1,0)(0,1)	5.189701	-0.08205	0.106544	-0.02298
(3,2)(0,0)	8.186029	-0.0818	0.248242	0.021568
(2,2)(1,0)	8.186029	-0.0818	0.248242	0.021568
(1,0)(1,0)	5.131786	-0.07805	0.110538	-0.01899

(0,2)(0,1)	6.123712	-0.0775	0.158243	-0.00367
(2,1)(0,1)	6.91202	-0.0629	0.219991	0.025699
(2,3)(0,1)	8.844924	-0.05827	0.318914	0.059859
(2,4)(0,0)	8.844924	-0.05827	0.318914	0.059859
(3,2)(0,1)	8.820751	-0.0566	0.320582	0.061526
(3,3)(0,0)	8.820751	-0.0566	0.320582	0.061526
(2,2)(1,1)	8.820751	-0.0566	0.320582	0.061526
(0,4)(0,0)	6.784921	-0.05413	0.228756	0.034465
(0,3)(0,1)	6.784921	-0.05413	0.228756	0.034465
(1,3)(0,0)	6.674888	-0.04654	0.236345	0.042053
(0,3)(1,0)	6.674888	-0.04654	0.236345	0.042053
(1,3)(0,1)	7.647519	-0.04466	0.28538	0.058707
(0,4)(1,0)	7.647519	-0.04466	0.28538	0.058707
(0,3)(1,1)	7.647519	-0.04466	0.28538	0.058707
(1,4)(0,0)	7.647519	-0.04466	0.28538	0.058707
(4,2)(0,0)	8.530127	-0.03656	0.340625	0.081569
(3,4)(0,0)	9.407687	-0.02812	0.396217	0.10478
(4,0)(1,0)	7.352536	-0.02431	0.305724	0.079051
(3,0)(1,1)	7.352181	-0.02429	0.305749	0.079075
(3,1)(1,0)	7.352181	-0.02429	0.305749	0.079075
(1,2)(1,0)	6.329204	-0.0227	0.260185	0.065894
(1,1)(1,1)	6.329204	-0.0227	0.260185	0.065894
(3,1)(0,1)	7.312179	-0.02153	0.308507	0.081834
(2,1)(1,1)	7.312179	-0.02153	0.308507	0.081834
(0,2)(1,1)	6.304173	-0.02098	0.261911	0.06762
(1,2)(0,1)	6.304173	-0.02098	0.261911	0.06762
(1,1)(1,0)	5.232293	-0.01602	0.21972	0.057811
(1,0)(1,1)	5.232293	-0.01602	0.21972	0.057811
(3,2)(1,0)	8.170064	-0.01173	0.365456	0.106401
(4,2)(0,1)	8.851545	0.010238	0.434571	0.143134
(2,4)(0,1)	8.844985	0.010691	0.435024	0.143587
(3,3)(0,1)	8.844975	0.010691	0.435025	0.143587
(2,4)(1,0)	8.844975	0.010691	0.435025	0.143587
(2,3)(1,1)	8.844975	0.010691	0.435025	0.143587
(3,2)(1,1)	8.834944	0.011383	0.435716	0.144279
(3,3)(1,0)	8.834944	0.011383	0.435716	0.144279
(1,3)(1,0)	6.680187	0.022056	0.352093	0.125419
(4,2)(1,0)	8.676456	0.022313	0.446647	0.155209
(1,3)(1,1)	7.64953	0.02417	0.401355	0.1423
(1,4)(1,0)	7.64953	0.02417	0.401355	0.1423
(0,4)(1,1)	7.547661	0.031196	0.408381	0.149325
(1,4)(0,1)	7.547661	0.031196	0.408381	0.149325
(4,1)(1,0)	7.539498	0.031759	0.408944	0.149888

(4,0)(1,1)	7.539498	0.031759	0.408944	0.149888
(4,1)(0,1)	7.499579	0.034512	0.411697	0.152641
(4,4)(0,0)	9.460345	0.037218	0.508699	0.18488
(4,3)(0,0)	8.363057	0.043927	0.46826	0.176823
(3,1)(1,1)	7.35223	0.044674	0.421859	0.162803
(1,2)(1,1)	6.348299	0.044945	0.374982	0.148308
(4,3)(0,1)	8.877585	0.077408	0.548889	0.22507
(4,2)(1,1)	8.868328	0.078046	0.549528	0.225708
(4,3)(1,0)	8.868328	0.078046	0.549528	0.225708
(3,3)(1,1)	8.844978	0.079657	0.551138	0.227319
(2,4)(1,1)	8.844939	0.079659	0.551141	0.227321
(1,4)(1,1)	7.794069	0.083168	0.507501	0.216064
(2,3)(1,0)	6.758534	0.085618	0.462803	0.203748
(4,4)(0,1)	9.551574	0.099891	0.618521	0.26232
(4,1)(1,1)	7.53971	0.10071	0.525043	0.233606
(4,4)(1,0)	9.465113	0.105854	0.624484	0.268283
(3,4)(1,0)	8.354995	0.113449	0.58493	0.261111
(4,3)(1,1)	8.901031	0.144756	0.663386	0.307185
(0,4)(0,1)	4.489127	0.173164	0.503201	0.276527
(4,4)(1,1)	9.467171	0.174678	0.740455	0.351872
(3,4)(0,1)	7.200102	0.193096	0.664578	0.340758
(3,4)(1,1)	4.130605	0.473751	0.992381	0.63618




Forecast Comparison Graph
100,000,000
80,000,000
60,000,000
40,000,000
20,000,000
0
2020
2025
2030
2035
2040
2045
2050
2055
2060


Akaike Information Criteria (top 20 models)
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-.10
-.12
-.14
-.16
-.18
-.20
-.22
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(4,0)(0,0)

VITAE

Name Hari Prashad Joshi

Student ID 6310930015

Educational Attainment

Degree	Name of Institution	Year of Graduation
Masters of Business Administration	International Institute of Management and Science Putalisadak, Kathmandu Nepal	2020
Bachelor of Business Administration	Everest College Thapathali, Kathmandu Nepal	2016

Scholarship Awards during Enrolment

Graduate School research Grant Award, Prince of Songkla University, for Doctor of Philosophy, 2020

Work – Position and Address

Managing Director H and J Group Pvt. Ltd. Baneshwor, Kathmandu Nepal