AGRICULTURE AID AND AGRICULTURE GROWTH IN NEPAL

AGRICULTURE AID AND AGRICULTURE GROWTH IN NEPAL

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By

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LETTER OF RECOMMENDATION FOR INTERNAL EXAMINATION

This thesis entitled 'AGRICULTURE AID AND AGRICULTURE GROWTH IN NEPAL' has been prepared by Mr. BAL KUMAR KALAKHETI under my supervision and guidance. I hereby recommend this thesis for the internal examination by the Thesis Committee as a partial fulfillment of the requirements for the Degree of MASTER of PHILOSOPHY in ECONOMICS.

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RECOMMENDATION LETTER FOR EXTERNAL EXAMINATION

This thesis entitled 'AGRICULTURE AID AND AGRICULTURE GROWTH IN NEPAL' prepared by Mr. BAL KUMAR KALAKHETI is recommended for final/external examination as a partial fulfillment of the requirements for the degree of MASTER of PHILOSOPHY in ECONOMICS.

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VIVA-VOCE SHEET

We have concluded the viva-voce examination of the thesis entitled 'AGRICULTURE AID AND AGRICULTURE GROWTH IN NEPAL' submitted by Mr. BAL KUMAR KALAKHETI in partial fulfillment of the requirements for the degree of MASTER of PHILOSOPHY in ECONOMICS. We found this thesis satisfactory in scope and quality and written according to the prescribed format. Therefore, we accept it for the degree of M. Phil. in economics.

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DECLARATION

I hereby declare that this M. Phil. thesis entitled "AGRICULTURE AID AND AGRICULTURE GROWTH IN NEPAL' submitted to the Central Department of Economics, Tribhuvan University (TU), is entirely my independent work prepared under the supervision of my supervisor. I have made due acknowledgements to all ideas and information borrowed from different sources in the course of writing this thesis. The results of this thesis have not been presented or submitted anywhere else for award of any degree or for any other purpose. No part of the contents of this thesis has ever been published in any form before. I shall be solely responsible if any evidence is found against my declaration.

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ABSTRACT

Being resource scarce economy, Nepal is continuously receiving foreign aid from 1950/51 onwards. In Nepal, most of the aid financed resources are directed to agriculture sector development. The main purpose of allocating aid to agriculture sector is to increase real agriculture sector output to strengthen the output by improving the physical, social and economic infrastructure of the agricultural sector. In spite of this, the real output of agriculture sector is low and stagnant. Therefore, this study first analyzes trend of foreign aid, foreign aid utilized in agriculture sector, other inputs, real agriculture sector output in Nepal. Then, it examines the impact of foreign aid utilized in agriculture sector along with other inputs on real agriculture sector output in Nepal.

The study applies both descriptive statistics such as averages and growth rates. Ordinary least squares regression modeling technique is applied with time series data spanning from 1975 to 2020. Along with summary statistics and partial correlation, it applies econometric tools.

The results on trend showed that size and growth rates of overall aid, foreign aid utilized in agriculture sector along with others agriculture inputs and agriculture sector output were highly instable over the study period. The variables foreign aid utilized in agriculture sector, Agriculture Sector Credit are positive and significant at 1 percent level and other variables Irrigated Land, Imported Chemical Fertilized, Government Expenditure in Agriculture Sector and Economically Active Population in Agriculture Sector are positive and significant at 5 percent level. The only variable Cultivated Land is positive and significant at 15 percent level with Agriculture Sector Output in Nepal. The adjusted coefficient of determination ($Adj.R^2$) is 88.0 percent. The F-statistics, which shows the overall fitness of the model, is statistically significant at 1 percent level of significance.

The study concludes that foreign aid utilized in agriculture sector along with other key inputs to agriculture sector contributing in the domestic economy and these variables should be increased keeping them stable to increase real output of agriculture sector in Nepal.

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ABBREVIATIONS AND ACRONYMS

ADB	:	Asian Development Bank
ADF	:	Augmented Dickey-Fuller Test
ADRL	:	Autoregressive Distributive Lag
APP	:	Agricultural Perspective Plan (APP
ASO	:	Agriculture Sector Output
BNP	:	Bangladesh Nationalist Party
BOP	:	Balance of Payments
CBS	:	Central Bureau of Statistics
DW	:	Durbin-Watson
ECM	:	Error Correction Model
EU	:	European Union
FY	:	Fiscal Year
GDP	:	Gross Domestic Product
GMM	:	Generalized Method of Moments
GNI	:	Gross National Income
GNP	:	Gross National Product
GON	:	Government of Nepal
IBRD	:	International Bank for Reconstruction and Development
IDA	:	International Development Agency
IMF	:	International Monetary Fund
J-B	:	Jarque-Bera Test
LDCs	:	Least Developing Countries
MOF	:	Ministry of Finance
NPC	:	National Planning Commission
NRB	:	Nepal Rastra Bank
ODA	:	Official Development Assistances
OECD	:	Organization for Economic Cooperation and Development
OLS	:	Ordinary Least Squares
OPEC	:	Oil and Petroleum Exporting Countries
PACT	:	Project for Agriculture Commercialization and Trade
RASO	:	Real Agriculture Sector Output
Rs.	:	Rupees

SSA	:	Sub-Saharan Africa
UK	:	United Kingdom
UNCTAD	:	United Nations Conference on Trade and Development
US	:	United States
USA	:	United States of America
USSR	:	Union of Soviet Socialist Republics
VAR	:	Vector Autoregressive
VECM	:	Vector Error Correction Model
VIF	:	Variance Inflation Factor
WDI	:	World Development Indicators

CHAPTER I

INTRODUCTION

1.1 Background of the study

Foreign aid is defined as economic assistance from one country to another, the recipient typically being a less developed country (LDC). Aid is usually intended either to provide humanitarian relief in emergencies, to promote economic development, or to finance military expenditure. Aid may take the form of outright gifts of money, which may be tied to purchases from the donor, or untied and available for expenditure anywhere. It may take the form of soft loans, on terms easier than those may available to the borrower in world capital markets. Aid may also be given in kind, including food, plant and equipment, military supplies or technical assistance (Pearce, 1996).

The broader definition of foreign aid subsumes all money classified as official development assistance and further incorporates military assistance, political development programs, export promotion, debt forgiveness and non-concessional lending by all bilateral and multilateral organizations. Foreign aid itself can be distinguished into various categories based on its purpose and effects, intended upon the recipient country. Financial assistance could be disbursed for various reasons including strategic, political, economic or cultural reasons, which in turn is used as a basis to differentiate various types of donors (Thirlwall, 2006).

However, this general concept of foreign aid is not sufficient in itself. Many writers and many national and international institutions have given various definitions regarding the philosophy of foreign aid. Rosenstein Rodan (1961) said that, "Aid refers only to those parts of capital inflow which normal market incentive do not provide. It consists of long terms loans, grants, soft loans, sale of surplus products for currency payment and technical assistance".

Whatever way foreign aid is defined, it does not make any difference because its main theme is economic assistance. It is generally intended either to provide humanitarian relief for the country or for accelerating economic growth or development mainly in developing the LDCs, where the development process is not moving smoothly. This

sort of assistance consists of grants, loans, technical assistance etc. and can be provided either multilaterally or bilaterally.

The final aim of foreign aid is to accelerate the development activities and try to make country self-standing. There is such condition that general expenditure is increasing and as result, internal resources are not sufficient. That is why foreign aid is necessary for supporting developmental expenditure. Therefore, in the present context where there is lack of resources there is compulsory and obligatory need of foreign aid for development of LDCs like Nepal.

Foreign assistance to agriculture is a portion of total ODA and includes such diverse components as agricultural research and extension, irrigation projects, rural roads, agricultural education and training, flood control projects, health improvement programs, integrated rural development projects, and agricultural policy assistance. It is difficult, and for our purposes not entirely appropriate, to separate agricultural from nonagricultural aid. Nevertheless, government survey reports of Ministry of Finance provides data on allocation of foreign aid by different sectors/headings.

Nepalese economy is dominated by agriculture sector and it is providing livelihoods to most of the poor households. From First to Fifteenth periodic development plan agriculture sector development is given high priority.

The Agricultural Perspective Plan (APP) on the Tenth Plan (NPC, 2002) focused on commercialization and diversification of the agriculture by cultivating higher value crops and creating conducive environment for the participation of private sector and reducing poverty by increasing agriculture production and employment opportunities (NPC, 2002). Considering the fundamental aspects of agriculture development, the basic feature of plan formation, implementation and monitoring process requires the huge amount of expenditure which is impossible through the national saving that is possible only either taking loan or receiving grants by major donors.

The first Foreign Aid Policy of Nepal was formulated in 2002 with a view to responding to policy gap in area of aid management. With fast changing aid dynamics, the 2002 policy needed to be updated in line with contemporary principles and the best practices widely adopted in global aid architecture (MOF, 2002). With a view to responding to the demand of the time shaped by global commitments towards aid and development

effectiveness and by Nepal's goal of graduating from its current status of 'Least Developed Country' by 2022, the Government of Nepal prepared a development cooperation policy and circulated among wider mass. The ultimate goal of this policy is to build a self-reliant economy and transform Nepal into a prosperous democratic country through the effective mobilization of development cooperation (MOF, 2014).

Nepal is facing different problems such as low level of living standards, low level of agricultural productivity, high rate of population growth, unemployment, low ability to pay for tax, high gap between revenue and expenditure, high level of trade deficit etc. Therefore, the country needs foreign aid to overcome the problems. To generate the employment, enhance the living standards and uplift all domestic savings only needs huge amount of public expenditure. Foreign aid brings physical and financial as well as technical knowledge, skilled man power, organization expenditure, advanced production techniques for increasing productivity and market information. Underdeveloped countries are always depends on aid to run development projects. In the country like Nepal, it is repeatedly heard the government being effortful to receive more foreign aid. Rapid increment in foreign aid is observed every year but it has not been fully utilized. It has happened due to inefficient administration, low absorptive capacity, corruption, delay in implementation of projects from recipient side and vested interest, directed aid programs, their strategic motives etc. form donor's side.

Nepal is continuously receiving foreign aid nearly since 1952. Most of the physical infrastructures were financed by foreign aid. Nepalese economy is persistently depended on foreign aid because of the geographical location and topography, wide spread poverty and high rates of population growth. Most of the earliest studies such as Singh (1996), Khadka (1996, 1997), Dhakal et al. (1996), Panday (2000), Mihlay (2002) were focused to aid-effectiveness linking the impact of foreign aid on economic growth and these studies were built on descriptive statistics. A few latest studies such as Bhattrai (2009) and Sharma and Bhattrai (2013) had utilized recent time series econometric tools to analyze the impact of foreign aid on economic growth of Nepal and the findings showed that foreign aid is contributing to per capita real GDP of Nepal. Even though there were the outstanding studies that analyzed the impact of aggregate foreign aid on real per capita GDP of Nepal, to the best of my knowledge, there is lack of the studies that analyzed the impact of share of foreign aid utilized in agriculture

sector on real agriculture sector output in Nepal. Thus, this study fills the gap in the field of aid effectiveness at sectoral level by examining the impact of foreign aid utilized in agriculture sector on real agriculture sector in Nepal applying both descriptive and analytical time series econometric tools.

Being an agrarian economy that provide large scale employment and livelihood to the people, government has ever given greater priority to agriculture sector. Government has allocated resources for irrigation facilities. Imports of chemical facilities and subsidies on chemical fertilizer are long operative pregame in agriculture sector in Nepal. Government has targeted programs to enlarge cultivated land and agriculture sector credit. Investments in agriculture manpower building is also under the priority. To invest in different inputs that are essential for agriculture sector, there needs of resources. Such resources are financed from both domestic and external resources. Nevertheless, among others, agriculture sector is key sector of economy and it takes large share in overall resources. Such share of resources is fulfilled mostly from foreign aid. Therefore, this study intends to fill gap whether agriculture sector foreign aid is effective in augmenting real agriculture sector output in Nepal in case of increasing the the share of foreign aid in agriculture sector.

1.2 Statement of the problem

Agriculture sector is the backbone of the Nepalese economy occupying large share in national income, livelihood, employment, industrial development and international trade. It provides employment about 65 percent of the population. The contribution of the agriculture sector to GDP is nearly 25.8 percent (CBS, 2020). However, agriculture as the main occupation is mostly unproductive. It is carried on in an old fashion with the absolute and out-dated methods of production. The yield from land is precariously low and peasants continue to live at subsistence level. Hence, to increase agricultural sector output and productivity is the main priority of Nepalese economy. Such priority were clearly crafted in all the periodic development plans from first to fifteenth plans. To modernize and commercialize the agriculture sector, it needs huge amounts of investments, particularly to increase quantity and quality of the agriculture sector inputs. To increase agriculture sector output, quantity and quality of agriculture inputs such as size of cultivated land, irrigation facilities, availability of chemical fertilizer, improved seeds, agriculture credit, agriculture tools and technology, pesticides,

agriculture sector manpower and researchers and trainings to the framers, agriculture marketing etc. need to should be regularly enlarged or improved. Only the domestic resources cannot satisfy such investments. As Nepalese economy is continuously facing resource deficit/gap from the fiscal year 1974/75 onwards, therefore foreign aid has become the one of the main source of filling the resource gap in Nepal. Hence, foreign aid is invited and utilized in different sectors of the economy. Among others, being key sector of employment and livelihood, large share of aid is utilized in agriculture sector development in Nepal.

In aid effectiveness literature, some authors supply evidence for the positive effect of foreign aid on economic growth contingent on some political, structural and/or institutional conditions (Burnside & Dollar, 2000; Dalgaard & Hansen 2001). Others are more cautious about concluding that foreign aid spurs economic growth (Boone, 1996; Easterly, 1999; Easterly, Levine & Rodman, 2003). Although there is a vast literature on foreign aid's effect on economic growth, a very limited number of studies tried to address the relationship between foreign assistance on agricultural growth (Dewbre, Thompson & Dewbre, 2007). Therefore, effectiveness of foreign aid on gross output and sectoral levels has become an issue for both the recipient and development partners.

Nepal is continuously receiving foreign aid from 1950/51 onwards. Development partners are providing millions of dollars for socio-economic development of the country. Out of overall foreign aid, a significant share of overall aid went to in agriculture development and this trend was continuously increasing in each upcoming fiscal years such as the amount of foreign aid utilized in agriculture sector was Rs 98.3 million in 1975 and it reached to Rs. 6553.4 million in 2020 folded by 70 times in 46 fiscal years (MOF, 2021).

Foreign aid to agricultural development can take several forms. Foreign exchange for the importation of agricultural inputs, capital for development projects, local currency allocations to the agricultural sector, and technical assistance activities. For purposes of this study, it is expected that aid inflows strengthen the yield output from those that are directed at improving the social and economic infrastructure in the agricultural sector and thereby can be expected to yield longer term results. Consequently, capital project assistance, such as that directed toward providing credit, was segregated from

assistance to projects with a longer maturity. Agricultural assistance directed toward short-run increases in output are foreign exchange for the importation of agricultural inputs (e.g., fertilizer and seed), local currency allocations to agriculture, and capital development projects such as credit, mechanization, and land preparation. Assistance to finance projects with long-term yields are capital development projects designed to improve the agricultural infrastructure, irrigation projects, and projects designed to increase domestic production of agricultural inputs such as fertilizer. Foreign assistance designed to help in building the basic institutions and develop the human skills required for sustained economic, social, and political development.

In the case of Nepal, despite the constant flow of foreign aid, and decades of aid-financed development efforts in agriculture sector, it remains one of the poorest countries in the world and the poorest in the South Asia. Even though most of the development projects related to agriculture sector in Nepal are financed by foreign aid and it absorbs large share of foreign aid, the output of agriculture sector is low and stagnant i.e. the average real agriculture sector growth was only 2.9 percent during the period 1975 to 2020.

Empirical studies infer that the impact of foreign aid on agriculture sector output growth have diverse results. Some of the empirical studies show that the impact of foreign aid utilized in agriculture sector has positive and significant impact on real agriculture sector output because it enlarges quality and quantity of agriculture inputs (Kherallah, Beghin, Peterson & Ruppel, 1994; Dewbre, Thompson & Dewbre, 2007; Kaya, Kaya & Gunter, 2013); Alabi, 2014; and Verter, 2017). Some other studies show that such results are significantly negative because of aid financing results into the reduction in local market prices of commodities that reduces the income of the farmers (Feeny, 2007; Ighodaro & Nwaogwugwu, 2013)). Additionally, Barkat and Alsamara (2019) display such impacts vary according to size of aid and economic status of countries. Nevertheless, there is lack of studies on impact of agriculture aid on agriculture sector real output in context of Nepal. Thus, it dare need to address the issue of agriculture sector aid effectiveness in context of Nepal. That's why, this study first analyzed trends of gross foreign aid utilized in agriculture sector and real gross agriculture sector output in Nepal. Then, it empirically investigated the impact of foreign aid utilized in

agriculture sector long with other agriculture inputs on real gross agriculture sector output between the periods 1974/75 to 2019/20.

1.3 Research questions

On this background of statement of problem, following research questions were answered:

i. How is in terms of trends of patterns of gross foreign aid utilized in agriculture sector and real gross agriculture sector output in Nepal?
ii. How is the impact of gross foreign aid utilized in agriculture sector along with other agriculture inputs on real gross agriculture sector output in Nepal?

1.4 Objectives of the study

The general objective of the study was to analyses the effectiveness of agriculture foreign aid on the growth of agriculture sector output in Nepal. However, the study attempted to the following specific objectives:

i. To trace out the trend of gross foreign aid utilized in agricultural sector and real gross agriculture sector output,
ii. To examine the impact of gross foreign aid utilized in agriculture sector along with other agriculture inputs on real gross agriculture sector output.

1.5 Hypothesis of the study

Considering the objectives of the study, the following hypothesis were tested:

i. H_0 : Gross foreign aid utilized in agriculture sector has no relationship with real gross agriculture sector output in Nepal.
   H_1 : Gross foreign aid utilized in agriculture sector encourages real gross agriculture sector output in Nepal.

1.6 Significance of the study

Agriculture sector is the backbone of the Nepalese economy occupying a place of pride in the field of national income, livelihood, employment, industrial development and international trade. However, agriculture as the main occupation is mostly

unproductive. It is carried on in an old fashion with the absolute and out-dated methods of production as a result. The yield from land is precariously low and peasants continue to live at a bars subsistence level. Hence, to increase agricultural productivity utilization of foreign aid in the form of technical assistance as well as in the form of donation will be fruitful for our country. Foreign aid is also useful for developing various agricultural infrastructures such as irrigation, subsidy in fertilizer, improved seeds, agricultural marketing etc. Therefore, foreign aid in the process of agriculture development, government should not hesitate to sign more aid if impact is positive.

Although there were the studies on the impact of foreign aid on real per capita GDP in context of Nepal (Singh (1996); Khadka (1996, 1997); Dhakal et al. (1996); Panday (2000), Mihlay (2002); Bhattrai (2009); and Sharma & Bhattrai (2013), there is lack of the studies on the impact of foreign aid utilized in agriculture sector and its impact on real agriculture sector. To fill such gap in the literature, this study estimates the impact of allocated amount of foreign aid in agriculture sector on real gross agriculture sector output. In case of Nepal, highest amount of aid is allocated to agricultural development activities and it is observed that high portion of aid allocation to agricultural economic activities is not contributing in enhancing output of agriculture origin. Further, the output of agriculture sector is highly volatile having very low sustainability. Therefore, the outcome of this study would provide new direction to policy makers in reviewing overall aid allocation policy as well as aid allocation policies within agriculture sector so that the contribution of aid on the real gross output of agriculture origins would be sustainably increased.

1.7 Limitations of the study

The minor limitations of this study are:

i. The study takes gross foreign aid utilized in agriculture sector as key independent variable and irrigated land, amount of imported chemical fertilizer, cultivated land for main cereal crops plus cash crops, agriculture sector credit, government actual capital expenditure on agriculture sector less gross foreign aid utilized in agriculture sector and economically active population engaged in agriculture sector as other agriculture real output enhancing variables.

ii. There is no readily available annual series data on economically active population. Therefore, economically active population annual series are interpolated and extrapolated based on census data points.
iii. The study is entirely based on secondary data.
iv. The explanatory variables are mostly chosen the agriculture inputs that have direct effect on real agriculture sector output.

1.8 Organization of study

The present study consists of six chapters. The first chapter deals with background of the study, statement of the problem, research questions, objectives of the study, hypothesis of the study, significance of the study, limitations of the study and organization of the study.

The second chapter presents with an extensive review of empirical literature regarding international and national context covering both cross-country studies as well as country case studies along with theoretical developments.

The third chapter explains research methodology. It comprises research design, conceptual framework, specification of variables and models, types and sources of data, data collection and organization scheme, econometric tools of data analysis and presentation.

The fourth chapter presents trends of foreign aid, gross foreign aid utilized in agriculture sector and real gross agriculture sector output in Nepal. Growth rates and averages are used to analyze trend of foreign aid, foreign aid utilized in agriculture sector and real agriculture sector output.

Chapter five is devoted to empirical analysis and the final sixth chapter summarizes findings, conclusions, recommendations and recommendations for future research.

CHAPTER II
LITERATURE REVIEW

2.1 Introduction

There is no huge body of literature on relationship between foreign aid utilized in agriculture sector and real agriculture sector output. During the last decade, a few numbers of empirical researches conducted to investigate the effects of foreign aid utilized in agriculture sector and real agriculture sector output based on endogenous growth theory. This chapter first surveyed theoretical developments, major transmission mechanism of foreign aid that benefits domestic economy. Secondly, it discussed economic growth theories focusing the role of foreign aid to grow an economy. Thirdly, it reviews empirical papers only focusing to impact of agriculture aid to agriculture output. The final sub-heading draws conclusions on the variables, modeling techniques, econometric tools and techniques of data analysis that were applied by the past studies. Nevertheless, final sub-section offers research gap in context of Nepal.

2.2 Theoretical developments to foreign aid

Agriculture development has been a matter of concern since the primeval times not only for policy makers but also for a layman. A number of theories have been developed and followed by many economists based upon resource availability, environment, and institutional and financial capacities. Traditionally, the foundation of agriculture growth has been laid upon the intensive labor availability and scarce capital inputs (Lewis, 1954). Moreover, agriculture-sector-based farm inputs, cheap raw material, and lower transport cost provide a support mechanism to agriculture development; which resultantly assists other sectors and enhances aggregate growth in a country (Lewis 1954; Johnston & Mellor, 1961).

In addition it is also argued that the LDCs are constrained with scarce land due to population pressure and inequitable land distribution. Similarly, scarce capital, low income and low domestic savings, market imperfections, and risk to adapt latest technologies are some of the basic issues which keep the labor productivity and overall agriculture output very low (Ghatak, 1984).

Along with the above mentioned reasons, Hayami and Ruttan (1985) argued that despite of having abundant labor, the LDCs have been facing problem of lower agriculture productivity due to their high population growth, high agricultural dependent population, and unsupportive government policies. The parallel development of others sectors' in order to absorb the surplus labor; the promotion of technical and skilled education; research and development policies, and dissemination of technological innovation are the responsibilities of the government. In developing countries, the poor institutional capacities have restricted the high productivity, whereas the productivity level in LDCs was once higher than that of the developed countries during 1960-1980 (Hayami & Ruttan, 1985).

Similarly, while discussing the agriculture development in developed countries, Hayami and Ruttan (1985) postulated a model of agriculture development and sustained productivity based upon the combination of two models as Kuznets'-Schultz perspectives (Schultz's theory of agriculture development (Schultz, 1964) and Simon Kuznets' theory of modern economic growth; findings and reflections (Kuznets, 1973)). The Kuznets'-Schultz perspective presented by Hayami and Ruttan (1985) asserted that agriculture growth and the positive and increasing rate of agricultural productivity determines the economic development process of any country. They tested their hypothesis on United States and Japan by taking technical and institutional changes as endogenous factors. They found that both countries have achieved a sustained agriculture growth and productivity for a century. Although their resource endowments were different to each other yet the institutional development played a significant role in diffusing the technological changes.

Hence, it can be said that in developing countries the government policies (spread over whole government system) sector also a play a significant role in the sector's development which created difference in productivity among developed and developing countries. The farm inputs and resource supply can be covered under the auspices of agricultural aid, which would provide the base to this study's theoretical framework.

2.3 Transmission mechanism of foreign aid

Savings and investment are considered as the two principal drivers of economic growth and development of an economy. There are four basic approaches which help to

analyses the transmission mechanism of foreign aid that supports the development process of the recipient countries (Taylor, 1994; Bacha, 1990; Phull, 2007). These approaches of gaps are saving-investment gap, foreign exchange earning-expenditure gap, the capital-absorptive capacity gap, and the fiscal gap.

2.3.1 Saving-investment gap approach

The savings–investment gap approach is based on the Harrod-Domar growth models (1939, 1946) and follows the footsteps of Rosenstein Rodan's (1943) 'Big Push' theory. Harrod-Domar growth models (1939, 1946) concentrate on the assumption that in a dynamic economy aggregate savings must be equal to the aggregate investment. The central argument of this model is to maintain a steady rate of growth which combines both multiplier and accelerator principles to determine the rate of growth of income that assumes ex ante saving must be equal with ex ante investment. The Harrod-Domar (1939, 1946) growth model assumes that domestic savings (S) is a constant proportion (s) of the national income (Y). If domestic saving could not fulfill the required investments, in such case foreign aid fills the gap. This study expects that lack of investment resources in agriculture sector particularly for agriculture inputs will be fulfilled from utilization of foreign aid.

2.3.2 Foreign exchange earning-expenditure gap approach

This foreign exchange earnings-expenditure gap approach concentrates on the importance of foreign aid as it supports to fill the foreign exchange reserves in an economy. The foreign exchange reserves of an economy determine its financial capacity to participate in the international trade. Adding to this, foreign exchange reserves also helps to buy advanced production techniques, managerial skills, research ideas that will help to reduce the cost of production. By considering the importance of foreign exchange reserves for a developing economy, this approach concentrates on the import capacity as the main constraint on domestic investment and growth. If the rate of change is experienced by export sector happens to be greater than the rate of change taking place of the import sector then the given economy will become increasingly self-reliant. This study expects that the resources received from foreign aid would provide the foreign exchanges for the agriculture inputs that are imported such as chemical

fertilizer, pesticides, improved seeds, modern equipment that are necessary to increase agriculture production and productivity.

2.3.3 The capital-absorptive capacity approach

This approach gives emphasis on the absorptive capacity of the recipient economy in relation to the utilization pattern of foreign aid inflows. The ability of the domestic economy to absorb both domestic capital and foreign capital determine the rate of return, which is sufficient to cover the cost of debt-servicing charges against these borrowings. This approach considers foreign aid as a catalyst as it supports domestic resources and further it will help in raising output and productivity. The whole mechanism by which foreign aid program positively influence the growth process of recipient economy can be analyzed by the help of the following manner: 'Foreign aid leads to increase in the domestic investible resources, which leads to increase in domestic investment and hence more investment lead to a higher economic growth in the recipient country' (Phull, 2007).

2.3.4 The fiscal gap

Recently, fiscal constraint has been considered as a factor that adversely affects the growth prospects of the highly indebted group of developing economies. Increase in the external debt burden in the recipient economies creates difficulties on the part of the government via budget deficit. This budget deficit may cause either foreign exchange constraints or overall savings restrictions in the recipient economy.

2.4 Theories of economic growth

Under this section, economic growth theories are elaborated linking them with how foreign aid stimulates real output of an economy.

2.4.1 The Harrod-Domar model

The Harrod-Domar model (1939, 1946) seeks to establish the unique rate at which investment and income must grow so that full employment level is maintained. According to this model, no economy can grow without investment which is determined by the level of total savings. The model is given as $S/K = \Delta Y/Y$, where K is capital, S

is saving, and Y is output. ΔY/Y represents the rate of economic growth. Hence, the Harrod-Domar model states that the rate of growth of the GDP is determined jointly by the national savings ratio and national capital output ratio.

This means the more economy saves and invests, the more it grows. To achieve a higher economic growth, the savings rate must be higher. If the domestic savings are not enough, then foreign savings will be required so that they can be translated into investments to boost domestic economic growth. It is intended that foreign aid induces both domestic and foreign savings and investments and it results into the higher level of growth.

The Harrod- Domar model is based on accelerator principle. According to this principle a certain amount of capital is required to support a given level of economic activity. The principle is presented as, K= kY, where k > 1. Investment represents change in capital stock such that; I = k ΔY where I is investment in time and ΔY is the change in GDP in period t. The role of international foreign aid in this principle is understood in the context of the determinants of income, Y= I+ C+ G+ NX, where C, I, G and NX, are private consumption, private investment, government expenditure, and net exports respectively.

Now if we incorporate the foreign aid (FA) in the autonomous expenditure such that; A*=G+NX+FA, this leads to Y= (A*- kY) / (1b (I-t)-k; Y = a (A*-kYt)) where 'a' is the multiplier which represents how a change in autonomous expenditure affects the equilibrium level of income. This equation shows how an autonomous shock (in this case an increase in capital stock out of an increase in foreign aid) will lead to an increase in income. Foreign aid has an effect on economic growth through 'a', since they lead to a change in A*.

2.4.2 The Solow-Swan model

The Solow (1956) Swan (1956) model is based on neo-classical assumptions and assumes a multifactor production function including labor and capital, which are assumed to be close substitutes. It assumes that the production function increases with each input bearing diminishing marginal return. When zero units of input are used for

either K or L, then nothing is produced. Also the production function exhibits constant returns to scale.

The Solow-Swan (1956) model consists of a production function which is given by: Y= F (K, L). Where, Y is output, K is capital and L is labor. Capital stocks include plant and machinery, bridges, factories and labor represents economically active population. Consequently, for an economy to grow there must be an increment in the stocks of capital through investment and supply of labor through population growth. Investment on capital stock depends on savings and foreign aid can be used as substitute or to increase the domestic fund hence increase in capital funds. Furthermore, future aid inflow can improve the credit worthiness of domestic investors, which may result into lower cost of capital in aid receiving economies.

2.4.3 The endogenous growth models

Following the shortcomings of the Solow-Swan (1956) model, Romer (1986, 1990) and Lucas (1988) attempted to 'endogenize' the sources of growth, so that the rate of growth would be determined within the model. The scholars of this time introduced new theories of technological discovery and adaptation that accounted for spillover effects, that is, the entirety of benefits from technological discovery can never fully be understood since one discovery can cause benefits in other areas that are not always understood or even recognized. This theory allowed economists to argue that technology causes increasing returns to scale. Instead of capital being limited by diminishing returns to scale, capital can be utilized in ever more efficient manners. Not only does this counterbalance the diminishing returns to scale, technology effectively offsets diminishing returns and allows theoretically limitless growth possibilities. The new economic theory discoveries allowed economists to better understand and explain the 'how of growth'.

The endogenous growth literature has produced two distinct approaches on how to incorporate human capital into models of economic growth. The first, which is due to Lucas (1988), regards the accumulation of human capital as the engine of growth. The second approach emphasizes the role of the human capital stock in the process of innovation and adoption of new technologies (Romer, 1990).

In the model formulated by Lucas (1988), human capital enters into the production function in the way in which technology does in the Solow-Swan model, that is, in labor-augmenting form. The economy consists of identical individuals (or representative agents) who are maximizing lifetime utility. Agents have control over two variables: the level of consumption, and the allocation of time between work and skill acquisition. The first variable determines the accumulation of physical capital, while the second variable affects an agent's future productivity. The model assumes that technology is constant. Population growth is taken as exogenous.

The linearity assumption in the Lucas model implies that the growth rate of human capital is independent of its level. In other words, no matter how much human capital has been accumulated, a given effort always produces the same percentage increase. Romer (1990) has offered a possible explanation why this may be plausible. The acquisition of skills may in fact facilitate or prepare 'learning'. He states that in primary school, children are taught basic knowledge (such as literacy) which may not improve their ability to contribute to production by very much. Instead, it may be a prerequisite for the acquisition of productivity-enhancing skills throughout the rest of their education and their professional career.

Since there are no diminishing returns to the acquisition of skills, human capital can grow without bound, thereby generating endogenous growth. The properties of the steady state in the Lucas model depend on whether there are external effects of human capital.

A second category of endogenous growth models maintains the assumption underlying the Solow-Swan model that technological progress is at the heart of economic growth. However, by no longer leaving technological change un-modeled, these theories acknowledge that a large portion of inventions is the result of purposeful research and development (R&D) activities carried out in reaction to economic incentives. This changes the role for human capital, which enters into these models as a catalyst of technological progress rather than as an independent source of sustained growth.

Nelson and Phelps (1966) were the first to contend that people's educational attainment may have a significant influence on their ability to adapt to change and introduce new technologies. Accordingly, a higher level of human capital would speed up the process

of technological diffusion in the economy. This would enable countries lagging behind the world technology frontier to catch up faster with the technological leader. However, in the model developed by Nelson and Phelps, the evolution of the best-practice level of technology is left exogenous, so that human capital only plays a role in helping countries narrow the gap to the technological frontier. Romer (1990) has extended this concept beyond the adoption of existing technologies to the creation of new ones, starting from the observation that R&D activities require highly skilled labor as the single most important input. A major implication of both of these approaches is that technological progress, and thus growth, depends on the stock of human capital (as opposed to its accumulation). In the Romer (1990) model, a one-time increase of the stock of human capital is sufficient to augment the rate of economic growth forever.

Generally, Romer (1990) distinguished between two categories of endogenous growth literature; these are models of imperfect competition and models of perfect competition. Models of imperfect competition consist of studies that explicitly model the decisions of private agents to undertake costly research and development (R&D). These studies introduce imperfectly competitive elements to the models by conferring monopoly power to the successful innovator. Without the potential to earn monopoly profits, no self-interested agent would incur the costs to engaging in R&D activities.

In summary, the endogenous growth theory provides a theoretical framework for analyzing persistent growth of output that is determined within the system governing the production process. One key assumption of these models is increasing returns to scale. The models also address technological spillovers and other positive externalities that may be present in the process of industrialization. An important implication of the new growth theory is that economies with increasing returns to scale do not necessarily reach a steady-state level of income.

In developing countries, the potentially high rates of return on investment (low capital-labor ratios) are often greatly eroded by lower levels of complementary investments in human capital, infrastructure, or R&D. Thus, the new models emphasize the importance of investments in human capital and potential gains from technology transfer from the technologically advanced countries in the form of foreign aid.

2.5 Empirical studies

There is small amount of literature on aid and agriculture sector output. Therefore, this study tries to review most of the literature published in peer reviewed journal articles both at sequence of international and Nepalese contexts in following paragraphs.

Norton, Ortiz and Pardey (1992) examined the impact of agricultural inputs such as livestock, labor, machinery, land, schooling, higher education, and foreign aid on real agriculture sector output. It estimated log linear model applying OLS (Ordinary Least Squares) method of regression with the panel data of 98 less developed countries from 1970 to 1985. The dependent variable was agricultural output and independent variables or inputs were livestock, labor, machinery, land quality index, schooling, higher education and Official Development Assistance (ODA). The paper found that foreign aid had a different impact on agriculture productivity depending on regions and countries. In fact, aid had enhanced agricultural productivity in Asia and, to a smaller magnitude, in sub-Saharan Africa, while the opposite result appeared in Latin America and the Middle East. In addition, aid seemed to be less effective in countries where the fiscal deficit and external debt were high.

Kherallah, Beghin, Peterson and Ruppel (1994) examined the impact of foreign aid on agriculture growth for a panel data of 56 developing countries over the period of 1974 to 1990. It applied using two stages simultaneous equation model. The paper found a positive relationship between foreign aid and agricultural growth. It demonstrated that a one percent increase in foreign aid led to a 0.75 percent increase in agricultural growth rate.

Aboagyea and Gunjal (2000) used a panel data of 19 sub-Saharan countries divided into three groups, according to progress made in liberalizing their economic policy environment (large, small and poor), over the period of 1981 to 1993. They found that the impacts of total aid (ODA) and gross domestic saving on agricultural export (defined as a share of agricultural export in total agricultural output) and domestic shares of agriculture (value added in agriculture) were different between 1970 to 1980 and 1981 to 1993. Furthermore, the OLS regression results showed that total aid and saving variables were significant only for the large group that undertook economic reforms and received more ODA than the other two groups. However, the impact of the

total aid was positive, while the impact of gross domestic saving was negative for the large group.

Dewbre, Thompson and Dewbre (2007) examined the impact of foreign aid on agriculture sector output with the panel data of 87 developing countries from 1985 to 2004. The paper applied OLS regression and the results showed that agricultural aid flows had a negative impact on agriculture growth due to the reduction in local market prices of commodities whose production has increased due to foreign aid flows. Meaning that, the reduction of prices hided the positive effect of aid on agricultural production as the agricultural GDP declined.

Feeny (2007) investigated aid effectiveness in Melanesia, a region consisting of Fiji, Papua New Guinea, the Solomon Islands, Vanuatu and New Caledonia. These countries were of great interest since they had not performed well despite being rich in resources and receiving large amounts of foreign aid. The paper examined the impact of foreign aid on agricultural growth and overall economic growth in Melanesia. The impact on agricultural growth was important since the majority of people in Melanesia live in rural areas, reliant on agriculture for their livelihoods. Using OLS method with the data of the period 1980 to 2001, results provided no strong evidence that foreign aid had impacted on the agricultural sector. However, the paper found the evidence that foreign aid had impacted favorably on economic growth.

Akpokodje and Omojimite (2008) studied the role of aid in agricultural output in Nigeria from 1970 to 2007. They established that foreign assistance to Nigeria has significantly contributed to the agricultural growth. The study mentioned that Africa has received the maximum foreign aid per capita and Nigeria has received less foreign aid as compared to other developing countries of Sub-Sahara Africa. The author used the simultaneous equation system wherein the endogenous variables included agricultural output, savings, agricultural imports and foreign aid. Exogenous variables were net agriculture exports, inflation, and per capita income. In case of Nigeria, domestic savings were not crowded out by the foreign assistance as Nigeria is a low-income country and so the imports were also not promoted. Agricultural growth in Nigeria is stimulated by foreign aid. The study argued that the effect of net exports on agricultural growth is positive but not significant.

Bhattrai (2009) examined the impact of foreign aid on real per capita GDP in Nepal during the period 1983 to 2002. The paper applied cointegration and error correction mechanism modeling techniques. The results showed that foreign aid was contributing to economic growth in Nepal. It recommended that foreign aid is effective in Nepal.

Feeny and Ouattara (2009) examined the impact of foreign aid on real agriculture sector output. The data consist of a panel with variables averaged over 4-year periods between 1970 and 2001. Data were imported from World Bank data base. Explanatory variables included the log of the initial GDP per capita, the number of assassinations, an ethnic diversity and assassinations interaction variable, institutional quality, money supply (M2) and regional dummies. Policy variables include the budget surplus, inflation and a measure of trade openness. The results from the Generalized Method of Moments (GMM) showed that foreign aid exerts a positive and statistically significant impact on the growth of per capita agricultural income.

Islam (2011) sought to provide a consistent and comparable set of data on the trends in the provision of aid to agriculture over time within the framework of changes in the pattern of sectoral distribution of total development aid. Furthermore, it examined the factors, relating both to the agriculture sector itself and to the priorities and allocation processes of the total aid, which may account for the decline in aid to agriculture over the past two decades or more. It analyzed how in recent years the agricultural sector, as conventionally defined, and investments in the sector were increasingly incorporated in the new and wider concepts of food security and rural development as well as investments in them. In the end, the paper evaluated in the foregoing context the various commitments of the quantitative targets of aid made by the donors in the period following the post-2007 food crisis for agricultural development and food security.

Ighodaro and Nwaogwugwu (2013) examined the effectiveness of foreign aid to the growth of the agricultural sector in Nigeria using the ARDL and the ECM approach and quarterly data covering the period 1981 to 2009. The paper applied time series econometric tools such as Augmented Dickey Fuller test of unit root, The Johansen cointegration test, Durbin-Watson (DW-test) and Breusch-Godfrey Serial Correlation test of autocorrelation, Breusch-Pagan test of heteroscedasticity, Jarque-Bera (J-B) statistics of normality and Variance Inflation Factor (VIF) test of multicolinearity were applied. All the relevant data were obtained from the Central Bank of Nigeria Statistical

Bulletins and the National Bureau of Statistics. Agriculture sector output was taken as dependent and domestic saving, gross foreign aid utilized in agriculture sector, agriculture labor and agriculture sector exports were as independent variables. The parameter estimated of foreign aid utilized in agriculture sector was appeared negative and insignificant both at the short and long run.

Kaya, Kaya and Gunter (2013) studied the impact of agricultural aid on agriculture sector output for developing countries. This study employed annual time-series data for the period 1974 to 2005 which were taken from World Bank's World Development Indicators 2008 (WDI). The results indicated a positive and statistically significant relationship between growth in the agricultural output and agricultural assistance for rural development.

Sharma and Bhattrai (2013) examined the impact of foreign aid in Nepal during the periods 1965 to 2008. It applied autoregressive distributed lag modeling. It took savings, foreign aid, labor force, total trade as openness, budget deficit as fiscal policy, broad money supply as monetary policy and a dummy variable being 0 for for 1965 to 1989 periods (autocratic regime) and *1* for 1990 to 2008 (democratic regime). The results showed that foreign aid is contributing to economic growth in Nepal.

Alabi (2014) investigated the impact of foreign agricultural aid on agricultural GDP and productivity in Sub-Saharan Africa (SSA). It relied on secondary data regarding foreign agricultural aid, agricultural GDP, and productivity indicators from 47 SSA countries spanning 2002 to 2010 and employed a Generalized Method of Moments (GMM) framework. The study revealed that the average sectoral aid allocation to agriculture in SSA was 7 percent during the study period, growing from 18 million USD in 2002 to about 47 million USD in 2010. The econometric analysis suggested that foreign agricultural aid had a positive and significant impact on agricultural GDP and agricultural productivity at 10 percent significance level, and that disaster and conflict also had a positive and significant impact on aid receipt at 5 percent significance level. The study also revealed that bilateral foreign agricultural aid influenced agricultural productivity more than multilateral foreign agricultural aid and that multilateral foreign agricultural aid influenced agricultural GDP more than bilateral foreign agricultural aid.

Verter (2017) investigated the impact of foreign aid on agriculture sector output in Nigeria during the period 1981 to 2014. The paper employed time series data taken from Food and Agriculture Organization of the United Nations (FAO), and Central Bank of Nigeria Statistical Bulletins. It took net agriculture crop production as dependent and agriculture official development assistance (AODA), amount of fertilizer, total agriculture sector credit and amount of CO^2emissions as independent variables. The results from OLS regression, Variance Decomposition and Granger causality showed that agricultural AODA had a positive connection with crop production in Nigeria. Diagnostic tests such as autocorrelation, heterocedasticity, multicolinearity and normality were condected. Similarly, the results also showed that local loans, and fertilizer application were the main drivers of agricultural production in the country.

McArthur and Sachs (2018) constructed a geographically-indexed applied general equilibrium model that considered pathways through which aid might affect growth and structural transformation of labor markets in the context of soil nutrient variation, minimum subsistence consumption requirements, domestic transport costs, labor mobility and constraints to self-financing of agricultural inputs. The model was presented for Uganda as an illustrative case. Three stylized scenarios demonstrated the potential economy-wide impacts of both soil nutrient loss and replenishment, and how foreign aid can be targeted to support agricultural inputs that boost rural productivity and shift labor to boost real wages. One simulation showed how a temporary program of targeted official development assistance (ODA) for agriculture could generate, contrary to traditional Dutch disease concerns, an expansion in the primary tradable sector and positive permanent productivity and welfare effects, leading to a steady decline in the need for complementary ODA for budget support. The paper concluded that foreign aid utilization had multidimensional impact on agriculture sector.

Barkat and Alsamara (2019) examined the impact of foreign agricultural aid and foreign aid on agriculture output in the panel data set of 29 African countries over the period of 1975 to 2013. The data were collected from the World Bank's World Development Indicators and Food and Agriculture Organization database. The variables of interest included Gross Agricultural Production (GAP) as a dependent variable. The paper disaggregates key dependent variable into two components, namely food production

(FP) and non-food production (NFP). Foreign aid for agriculture (FAA) and total foreign aid (ODA) were the main explanatory variables. Other control variables were agriculture labor (L), arable land (AL), gross domestic saving (SAV), agricultural imports (IMP) and exports (EXP). It employed two estimation methods: Augmented Mean Group and Common Correlated Effects-2SLS. The first method accounted for heterogeneous slope coefficients across group members and cross-sectional dependency among variables, whereas the second method accounted for endogenous regressors. The main findings indicated a small and positive impact of foreign agricultural aid and total foreign aid on agricultural output for low- and middle-income countries. Furthermore, the pairwise panel Causality test showed evidence of a bidirectional causal relationship between agricultural aid and agricultural output.

Maruta, Banerjee and Cavoli (2019) examined the effect of sectoral foreign aid and institutional quality on the economic growth of 74 developing countries from Africa, Asia and South America, and covered the period 1980 to 2016. The paper considered bilateral aid flows into three sectors, namely education, health and agriculture, and found that among the three types of aid, education aid was more effective for aid receiving countries. The effect was conditional on the current level of institutional quality and varied substantially across regions. While education aid was more effective in South America, health aid was more effective in Asia and agricultural aid was more effective in Africa. As the level of institutional quality improves, the gap between the marginal effect of education, health and agricultural aids widens. The findings had strong policy implication for donor countries and international aid organizations, which showed that it was more desirable to shift aid flows towards the education, health and agriculture sectors.

2.6 Conclusions

The theoretical literature suggested that foreign aid induce real output through inducement in the inputs. Increase in investments upsurge the quantity and quality of agriculture inputs. The growth models suggested that increase in capital in the form of foreign aid induces investments in agriculture projects that resulted into increase in real output of the agriculture sector.

The empirical studies took agriculture real output as dependent and agriculture inputs such as foreign aid utilized in agriculture sector, cultivated land, agriculture sector credit, amount of fertilizer used in agriculture farming, government capital expenditure in agriculture sector, irrigated land, inflation, broad money supply, total trade etc. as explanatory variables. Along with descriptive statistics (average and standard deviation), the studies had applied time series econometric tools such as Augmented Dickey Fuller test of unit root, The Johansen cointegration test, Durbin-Watson (DW-test) and Breusch-Godfrey Serial Correlation test of autocorrelation, Breusch-Pagan test of heteroscedasticity, Jarque-Bera (J-B) statistics of normality and Variance Inflation Factor (VIF) test of multicolinearity. The results were diversified and contradicted according to regions and countries. Large number of the empirical showed that the impact of foreign aid utilized in agriculture sector on agriculture sector output had positive and significant (Kherallah, Beghin, Peterson & Ruppel, 1994; Dewbre, Thompson & Dewbre, 2007; Kaya, Kaya & Gunter, 2013; Alabi, 2014; and Verter, 2017). A few studies showed such results were significantly negative (Feeny, 2007; Ighodaro & Nwaogwugwu, 2013). Additionally, the results of Barkat and Alsamara (2019) displayed such impacts varied according to size of aid and economic status of countries.

In the context of Nepal, most of the past studies only focused to impact of overall aid on economic growth of Nepal. To the best of my knowledge, the study on the impact of foreign aid utilized in agriculture sector on agriculture sector output is absent in case of Nepal. Therefore, there is need of an in-depth study that examined trend and relationship between agriculture sector output and foreign aid utilized in agriculture sector and the impact of foreign aid utilized in agriculture sector is utmost importance. This study fills the gap in the literature in context of Nepal.

CHAPTER III
RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the procedures followed to achieve objectives of this study. It deals with research methodology and methods; research design, conceptual framework, nature and sources of data, sample period and data presentation and different tools and techniques of data analysis issues, specification of variables and models that are necessary to estimate relationship between foreign aid utilized in agriculture sector and real agriculture sector output in Nepal.

3.2 Research design

The research design consists of stages of research plan. The research process starts from selection of research topic. This study takes foreign aid utilized in agriculture sector and real gross agriculture sector output in Nepal as study topic which is selected because of increasing more resources of foreign aid in agriculture sector in Nepal over the years and this trend is further taking speed after the country went to Federal Structure. The study is based on quantitative data. Thus, the research is quantitative in nature bases on completely secondary source of data publishes by domestic institutions.

In the second stage of defining the problem statement and research questions, a thorough analysis of both the theoretical and empirical literature on foreign aid utilized in agriculture sector and real agriculture sector output is conducted. The literature covers mostly from developing countries. The study also discusses previous empirical studies on Nepal in more detail with wide coverage if there are any. The comprehensive literature review guides the study in constructing problem statement, research questions, key objectives and hypotheses.

The third stage involves collecting and managing research data. At this stage, a process of collecting data and important information is initiated and collected raw data are kept in spread sheet. Sample period and statistical methods are chosen according to availability of data. Data on foreign aid utilized in agriculture sector and real agriculture sector output along with control variables are collected from statistical organizations

and institutions such as Nepal Rastra Bank (NRB); Ministry of Finance (MOF); Central Bureau of Statistics etc.

The fourth stage selects data analysis tools and techniques according to availability of data. It prescribed different sets of models. It proposes different statistical methods of analysis and presentation of data. In the next fifth stage, data are analyzed and interpreted according to proposed econometric models and conclusions are driven. Results are compared with earlier studies and contradiction on the results are discussed and supported with existing growth theories related to foreign aid utilized in agriculture sector and agriculture sector output.

3.3 Conceptual Framework

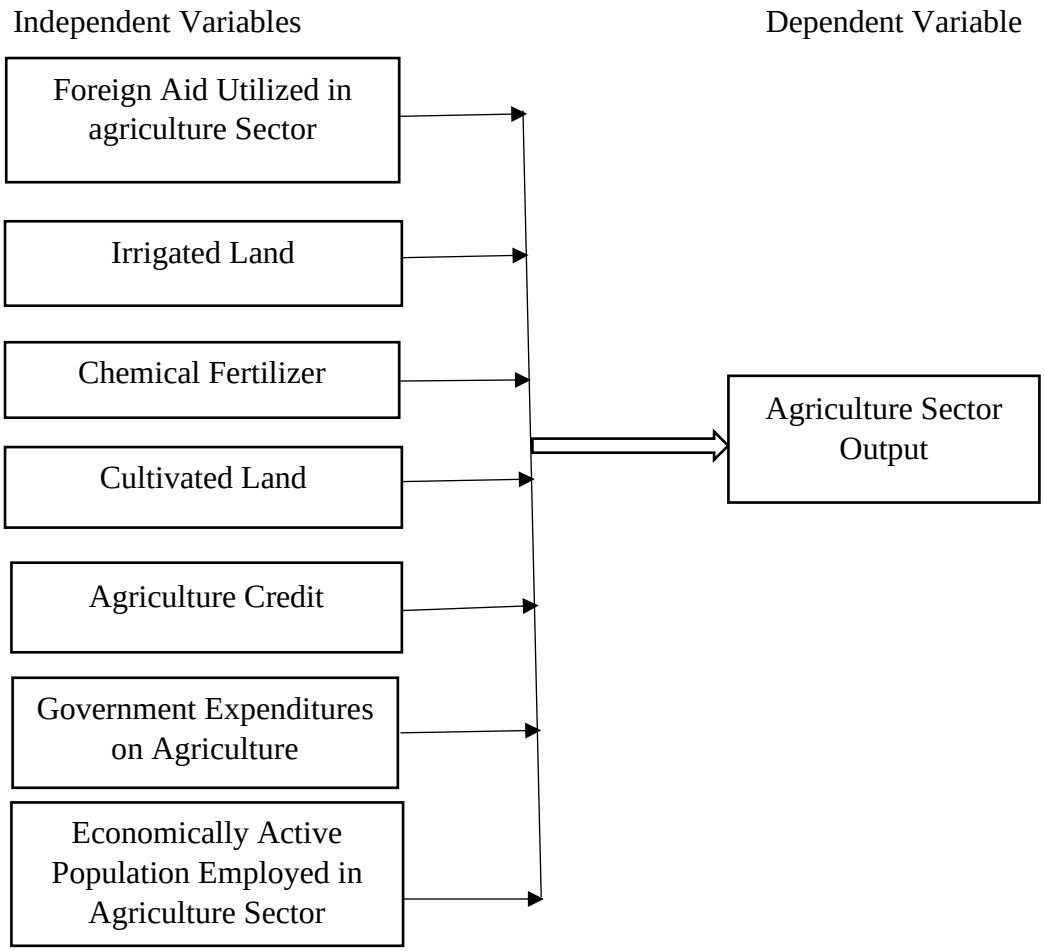
The savings-investment gap approach is based on the Harrod-Domar growth models (1939, 1946) and follows the footsteps of Rosenstein Rodan's 'Big Push' theory (1943). Nepal is one of the least developing country and Nepal economy is continuously facing resource gaps. Therefore, foreign aid utilized in agriculture sector is expected to fill the resource gap in agriculture sector and it is expected such resources would accelerate agriculture sector output in Nepal.

The conceptual framework aims at depicting dependent and independent variables used in the empirical analysis. Agriculture sector output is affected by a number of factors. In this study, real gross agriculture sector output is used as dependent variable to measure agriculture sector growth. On the other hand, independent variables includes gross foreign aid utilized in agriculture sector and other control variables which do not necessarily affect foreign aid utilized in agriculture sector but have an effect on real gross agriculture sector output. Based on empirical literatures (Kherallah, Beghin, Peterson & Ruppel, 1994; Dewbre, Thompson & Dewbre, 2007; Feeny, 2007; Kaya, Kaya & Gunter, 2013; Alabi, 2014; Verter, 2017; Ighodaro & Nwaogwugwu, 2013; Barkat & Alsamara, 2019 and many others), this study takes irrigated land, amount of imported chemical fertilizer, cultivated land for main cereal crops plus cash crops, agriculture sector credit, government capital expenditure on agriculture sector less foreign aid utilized in agriculture sector and economically active population employed in agriculture sector as control variables. The study analyzes dependent and independent variables under endogenous growth modelling techniques. The trend of

independent variables and dependent variable is analyzed with the annual average 3- and 5-years growth rate of the given variable whereas the empirical results are obtained from OLS regression that have following independent variables and dependent variable. The model is based on Barkat and Alsamara (2019):

Figure 3.1

Schematic diagram of foreign aid and agriculture sector output



Source: Self Developed

3.4 Nature and sources of data

The study is primarily based on the secondary sources of data. The data are collected from Economic Survey Reports, Ministry of Finance, Government of Neal, Reports on National Accounts of Nepal, Central Bureau of Statistics, National Planning Commission Secretariats and Government of Nepal. The data on Economically Active Population Employed in Agriculture Sector are calculated via interpolation and extrapolation based on information of Population Census Reports of the censuses 1971,

1981, 1991, 2001 and 2011 that are published by Central Bureau of Statistics, National Planning Commission Secretariats, Government of Nepal. The complete data series that are employed in the analysis are managed in Microsoft Excel sheet. The study also keep these the empirical data sets in Appendix 1.

3.5 Study period covered

The study uses annual data from FY 1974/1975 to FY 2019/2020 comprising 46 observations. The study symbols FY 1974/1975 as equivalent to 1975 and so on.

3.6 Methods of data collection

Empirical secondary data and information are collected through various domestic published sources. Published sources of data are collected from various issues of Economic Survey Reports, published by Ministry of Finance, Government of Nepal, National Accounts of Nepal and Statistical Year Books, Statistical Pocket Books, Population Census Reports, Population Monographs published by Central Bureau of Statistics, National Planning Commission Secretariats, Government of Nepal.

3.7 Data organization, management and processing

Collected data and information are organized, managed and processed in context with given research question and to satisfy the objectives of the study. Data used in this study are time series data. Data on agriculture sector output and foreign aid utilized in agriculture sector along with other control variables tabulated in the clear table according to ascending time period and the data table are kept in the Appendix 1 of the study.

3.8 Tools and techniques of data analysis

The study is going to use econometrics mathematical and statistical tools like descriptive analysis and partial correlation between independent variables and independent variable, unit root tests, cointegration test, serial correlation, heteroscedasticity, multicollinearity, normality and hypothesis testing.

3.8.1 Descriptive analysis

Generally, growth rates, ratios and moving averages are used to describe the data trends. Basic structures of the variables regarding its central location (mean); spread (standard deviation), shape (skewness and kurtosis), and volatility and normality (Jarque-Bera) can be presented as a summary statistics. All variables that are employed to the model are converted into natural logarithms to facilitate the calculation of elasticity and to make it possible the transformation of the non-linear models into log linear one. A correlation matrix of used variables is presented to know how the dependent variable is proportional to all explanatory variables for each model.

3.8.2 Unit root tests

One of the important types of data used in empirical analysis is time series data. Researcher takes such data in practice because they cause several challenges to econometricians and practitioners. Generally, empirical works based on time series data assume that the underlying time series is stationary. Therefore, it is important to determine the characteristics of the individual series before conducting empirical analysis. This is important because in the absence of non-stationary of time series variables, the normal properties of t-statistics and measures such as R-squared break results, hence a problem. The econometric methodology applied therefore begins by examining the rank of integration for the series of the dependent and explanatory variable in their natural log format using the Augmented Dickey-Fuller test. The regression equation for the ADF test of unit root can be written as follows:

$$\Delta Y_t = \alpha + \beta_t + \sum \delta_t \Delta Y_{t-1} + \mu_t \qquad (3.1)$$

Where, the t symbol denotes time trend, Y is the variable in estimation procedure, μ represent the distributed random error term with zero mean and constant variance. Assuming that μ_t is serially uncorrelated and using the AR (ρ) process, the hypothesis for the ADF test is specified as follows:

H_O : δ = 1 is the Null Hypothesis implying unit root, and

H_1 : δ < 1 is the Alternative Hypothesis implying stationary

This study considers Augmented Dickey-Fuller (ADF) (Dickey & Fuller, 1979; Dickey & Fuller, 1981). unit root tests to all individual variable of interest. Non-stationary individual series are then transformed to stationary through difference stationary process if they suffer from unit root.

3.8.3 Cointegration test

Johannsen cointegration test (Johansen, 1988, 1991; Johansen & Juselius, 1990) is conducted to examine either there is long run relationship between the variables or not. In order to carry out cointegration test, the order of the VAR is necessary. The order of lags of the cointegration equation takes different criterion such as Akaike's Information Criterion (AIC), Schwarz's information criterion (SIC), Phillips' posterior information criterion (PIC), and Keating's (1995)'s application of the AIC and SIC criterion (KAIC and KSIC), Hannan and Quinn (HQ) etc. Different software packages have different methods for determining value of lags. For the purpose of this study, it accepts the number of lags that are automatically selected by the statistical software Eviews 10.

3.8.4 Serial correlation

Autocorrelation (serial correlation) occurs when the error term observations in a regression are correlated. The most common type of autocorrelation is first-order autocorrelation, and it is usually present when an observed error tends to be influenced by the observed error that immediately proceeds in the previous time period. The existence of autocorrelation in the residuals indicates that the assumption $E(\varepsilon_i\ \varepsilon_j) = 0$ has been violated. It is important to be sure that there is no autocorrelation in the residuals because; otherwise the standard errors are invalid.

Durbin-Watson (DW-test) and Breusch-Godfrey Serial Correlation test are applied to detect the problem and order of serial correlation in the error terms and Cochrane-Orcutt method is used to correct the autocorrelation. If serial correlation problem is not handled at first step of Cochrane-Orcutt procedure, then its iterative procedures are conducted.

3.8.5 Heteroscedasticity

The existence of heteroscedasticity in the errors implies that the assumption of constant variance in the errors is violated i.e. $V(\varepsilon_t) \neq \sigma^2$. If this is the case, heteroscedasticity

in the errors do not affect the un-biasness of the OLS estimates but it affects their precision. The standard errors become biased and the tests of statistical significance cannot be valid. Breusch-Pagan test of error term is conducted to detect the problem of heteroscedasticity and weighted least squares technique is used to minimize it.

3.8.6 Normal distribution

It is also important to check that the residuals are normally distributed; this is done with the Jarque-Bera (J-B) statistic. This statistic tests whether there is a significant difference of skewness and kurtosis of the residuals from the normally distributed residuals. The null hypothesis is that the residuals are normally distributed. The J-B has a Chi-square distribution and if it is rejected the residuals are said to be normal. Two components of this statistic are Skewness and Kurtosis. Skewness measures the symmetry of a normal distribution and its expected value is zero. Regarding Kurtosis, this is an indicator that measures how peaked and flat the distribution is, a normal distribution is expected to have kurtosis equal to 3.

3.8.7 Multicolinearity tests

The independent variables sometimes show correlation among them. To check correlation among the independent variables, Variance Inflation Factor (VIF) test is conducted and from the highly collinear pair, one of the variables is avoided. The avoided variable will be examined in another set of equation.

3.8.8 The statistical tests of significance

The statistical tests of significance are taken as the criterion for selecting most effecting and significant variables. To identify the statistical significance of the regression coefficient, t-test is performed. Similarly, overall significance of model is tested by using F-test. Further, to measure the percentage of total variation in dependent variable explained by the independent variables in the model, coefficient of determination (R^2) and adjusted coefficient of determination ($\bar{R}^2$) are used.

3.9 Specifications of models

This study uses Ordinary Least Squares (OLS) technique of estimation with dependent variable as real gross agriculture sector output (RGASO) and gross foreign aid utilized in agriculture sector (GFAUAS) as an independent variable. Therefore, the conceptual equation of the study is:

Real Gross Agriculture Sector Output = f (GFAUAS) (3.2)

Real gross agriculture sector output is also affected by a number of other than foreign aid utilized in agriculture sector such as other inputs to agriculture sector. Therefore, the study introduces a number of Control Variables (CV) into the above equation (3.2). Inclusion of CV helps control of variability. Thus, the modified growth equation of (3.2) is:

Real Agriculture Sector Output = f (GFAUAS, CV) (3.3)

Following the previous literatures (Kherallah, Beghin, Peterson & Ruppel, 1994; Dewbre, Thompson & Dewbre, 2007; Kaya, Kaya & Gunter, 2013; Alabi, 2014; Verter, 2017; Feeny, 2007; Ighodaro & Nwaogwugwu, 2013; Barkat & Alsamara, 2019) and using researcher's own institution, the following multiple regression equation is specified to estimate the effect of agriculture centric foreign aid to Nepal along with other explanatory variables.

$$\mathrm{RGASO_t} = \alpha_0 + \alpha_1 \mathrm{GFAUAS_t} + \alpha_2 \mathrm{IRL_t} + \alpha_3 \mathrm{ICF_t} + \alpha_4 \mathrm{GCL_t} + \alpha_5 \mathrm{ASC_t} + a_6 \mathrm{GEXPAS_t} + a_7 \mathrm{EAPEAS_t} + \varepsilon_t \quad (3.4)$$

In the equation (3.4), RGASO is Gross agriculture sector output is measured by Real Gross Agriculture Sector Output and it is dependent variable. Since this study examines the relationship between gross foreign aid utilized in agriculture sector output and real gross output of agriculture sector. Hence, the key independent variable is annual gross foreign aid utilized in agriculture sector. The main independent variable is denoted by (GFAUAS). The study applies addition annual Irrigated Land (IRL), Amount of Annual Imported Chemical Fertilizer (AICF), Gross Annual Cultivated Land for major Cereal Crops plus Cash Crops (GCL), Annual Agriculture Sector Credit (ASC), Government

Expenditures on Agriculture sector (GEXPAS) and Economically Active Population Employed in Agriculture Sector (EAPEAS) as control variables.

Where,

RGASO = Annual Real Gross Agriculture Sector Output (Rs. million)
GFAUAS = Annual Gross Foreign Aid Utilized in Agriculture Sector (Rs. million)
IRL = Annual Additional Irrigated Land (In hector)
ICF = Annual Imported Chemical Fertilizer (In thousand metric ton)
GCL= Annual Gross Cultivated Land (Cereals plus Cash crops) (In thousand hector)

ASC = Annual Agriculture Sector Credit (Rs. Million)
GEXPAS = Annual Government Expenditures in Agriculture Sector (Current plus Capital Expenditures) (Rs. million)
EAPEAS= Annual Economically Active Population Employed in Agriculture Sector (Interpolated based on Census data points) (In million)
t = Time
ε_t = Error term

The key variable of this study is foreign aid utilized in agriculture sector. There is always lack of resources in agriculture sector and the role of foreign aid in the development of agriculture sector is incredible. Therefore, the variable is chosen and it expects that the impact of foreign aid on agriculture sector output would be positive.

Irrigation affects the spatial distribution of agricultural production by allowing: (i) the growing of crops on land that was unable to sustain agriculture under rain-fed conditions; (ii) the more intensive growing of existing crops; and (iii) the growing of alternative crops. Small-scale irrigation offers the potential to expand production. During the rainy season, irrigation can reduce production risks from inadequate rainfall. Therefore, the variable is chosen and it expects that increase in irrigation facilities increase real agriculture output. Thus, the coefficient of the variable irrigated land would be positive.

Chemical fertilizers allow growers to maximize their crop yield on a specific piece of land the more the plant grows, the better. Fertilizer works to ensure that each piece of land produces as efficiently as possible. Thus, it is selected. However, excessive use of

chemical fertilizers has led to several issues such as serious soil degradation, nitrogen leaching, soil compaction, reduction in soil organic matter, and loss of soil carbon. This study expected that imported chemical fertilizer is not sufficient to use excessively in Nepal. Therefore, its impact on agriculture output would be positive and its coefficient would take positive sign.

The increase in cultivable land area affects the agricultural sector, because agricultural activities are done in agricultural sectors or fields, and if cultivation lands are increased then agriculture output will also increase and there will be more production of food. Increase in investment in agriculture sector might increase agriculture area of cultivation by two ways- use of pasture or forest land for agriculture farming and same size land is used more than twice or thrice to produce new variety of off seasoned crops/vegetables. Therefore, it is selected and it expected that increase in the cultivated land would increase agriculture sector output. Hence, the expected sign of cultivated area would be positive.

Agricultural credit, which is also commonly referred to as agricultural finance, is an important component of the economy, especially in countries with arable land since agricultural products can be exported. Credit is vital to agricultural businesses because it gives farmers access to capital that might not otherwise be available to them. It helps them secure the seeds, equipment, and land they need to operate a successful farm. Agricultural credit programs not only help farmers and other agricultural producers, but also supports ranchers and rural homeowners with their finances. Hence, it is chosen and it's on real agriculture sector output would be positive and the coefficient would bear positive sign.

Government can directly influence activities in the agricultural sector directly and indirectly using both the capital expenditure and recurrent expenditure. Capital expenditure involves expenditure on the building of feeder roads in rural areas, silos, tractors and other equipment for farmers, resulting in increased output wellbeing of lives of people in those areas. Provision of loan facilities, subsidizing of farm input and financial support to farmers would make the agricultural sector more attractive and raising entrepreneurship in agribusiness, thereby leading to positive externalities to other sectors of the economy. Thus, it is selected as an explanatory variable and the

sign of the coefficient of government expenditures in agriculture sector would be positive.

Labor is the most important input in increasing production in traditional agriculture. In the early stage of development, since land was available in plenty increase in labor supply led to the clearing of more land for bringing it under cultivation. Agriculture accounts for 33 percent of Nepal's gross domestic product (GDP) but accounts for 74 percent of total employment in Nepal. Even though agriculture sector employment is decreasing, the share in total employment is highest of all sectors. Therefore, it is applied as an explanatory variable and the study expected that the coefficient of agriculture labor force would be positive.

To calculate ratios of RGASO and GFAUAS to GDP, following formula are applied.

RGASO to GDP Ratio = RGASO/GDP × 100 (3.5)

The growth rates of all the dependent and independent variables are calculated using following formula. Here, only RGASO and GFAUSA are illustrated.

Growth Rate of RGASO = $\frac{RGASO_t - RGASO_{t-1}}{RGASO_{t-1}} \times 100$ (3.6)

Growth Rate of GFAUAS = $\frac{GFAUAS_t - GFAUAS_{t-1}}{GFAUAS_{t-1}} \times 100$ (3.7)

In the same manner, the growth rate of foreign aid, cultivated land, imported chemical fertilizer, irrigated land, agriculture sector credit, government capital expenditures on agriculture sector less aid and agriculture sector labor force are also calculated. Increase and decrease in the size of both ratios and growth rates of the variables specified above reflects the trend of said variables. The sources of data of the variables applied in the model are specified below:

RGASO = Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, National Accounts of Nepal, Ministry of Finance, Government of Neal

GFAUAS = Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal

IRL = Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal

ICF = Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal.

GCL= Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal.

ASC = Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal.

GEXPAS = Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal.

EAPEAS= Interpolated and Extrapolated based on census data points of Census Reports, 1971, 1981, 1991, 2001 and 2011, Central Bureau of Statistics, National Planning Commission Secretariats, Government of Nepal.

CHAPTER IV
TREND OF FOREIGN AID AND FOREIGN AID UTILIZED IN AGRICULTURE SECTOR IN NEPAL

This chapter explains about the trend foreign aid and foreign aid utilized in agriculture sector in Nepal employing a descriptive approach between the periods 1975 to 2020. The sections of this chapter describe volume of foreign aid, growth rates of foreign aid and ratios of foreign aid to GDP in Nepal. The chapter also describe growth rate trend of foreign aid utilized in agriculture sector, cultivated land, imported chemical fertilizer, irrigated land, agriculture sector credit, government capital expenditures on agriculture sector less aid and agriculture sector labor force.

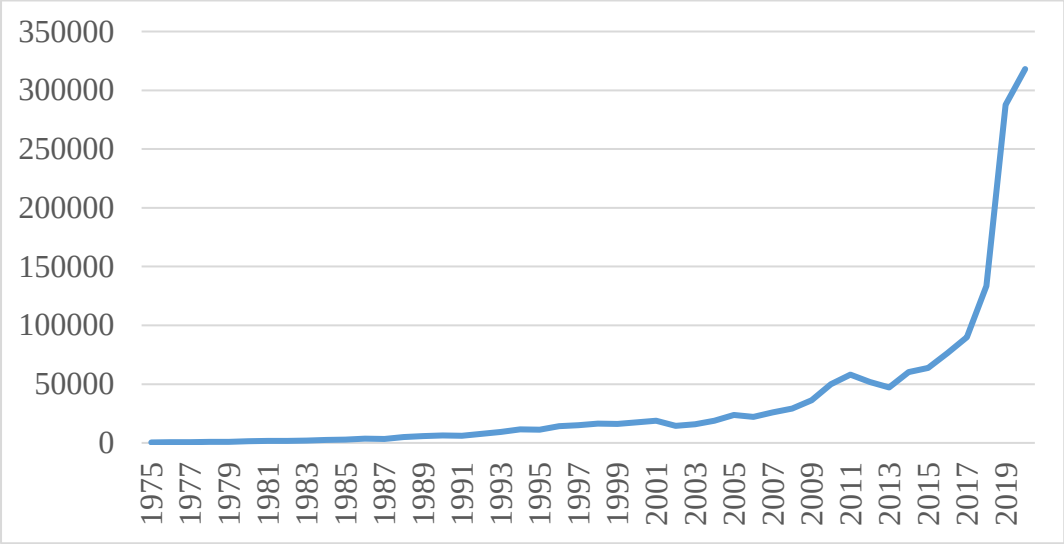
4.1 Volume of foreign aid

Volume of foreign aid is measured annual Nepalese currency. It evaluates whether foreign trade components in domestic currency are increasing over the study period or are they falling. Nevertheless, it shows how the amount of foreign aid is increasing and decreasing over the study period. The volume of foreign aid is both increasing and decreasing over the study period. Foreign aid is increased in 38 annual episodes whereas it was decreased for 8 annual episodes over the study period.

The annual trend of monetary volume of foreign aid roughly shows more of increasing and less of decreasing trend over the study period. Foreign aid was increased in 38 fiscal years and it was decreased in the fiscal years 1987, 1991, 1995, 1999, 2002, 2006, 2012 and 2013 (Figure 4.1).

Figure 4.1

Annual foreign aid in Nepal from 1975 to 2020 (Rs. in million)



Source: Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal.

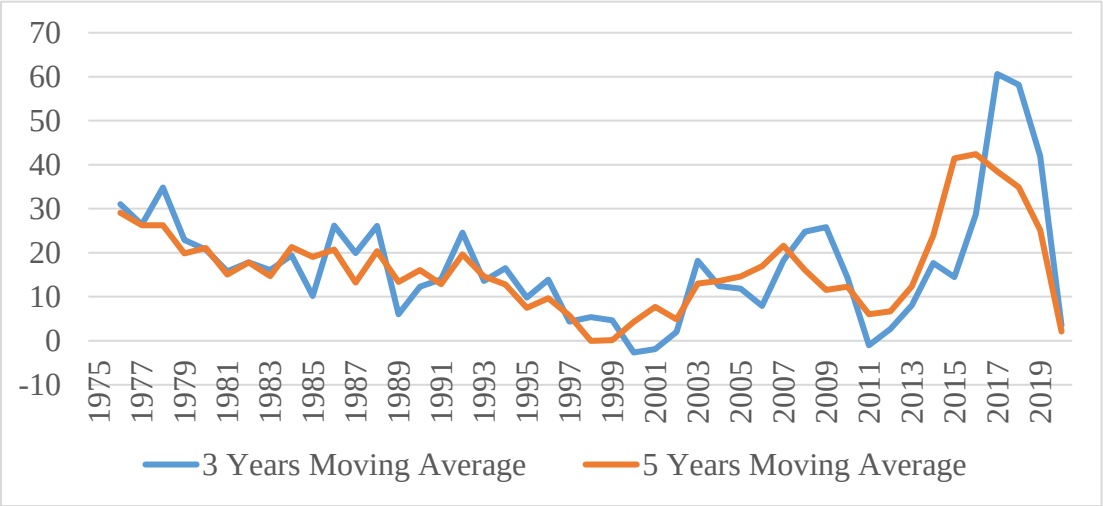
4.2 Growth rates of foreign aid

Trend of foreign aid according to volume showed only increasing and decreasing trend. To have actual up and down trends according to size, growth grate trends were applied. The annual growth rate trend lines show ups and downs of the variables in the analysis. This study took growth rates of annual foreign aid in its analysis. So, it visualized the upward and downward trend of the said variable. The trend line clearly indicated that annual growth rates of foreign aid was volatile.

The annual growth rates of foreign aid had 22 upward and 23 downward trends within the whole study period. The average growth rate of foreign aid was 17.8 percent with the standard deviation of 22.0 percent. The trend line clearly showed the upward and downward trends of the said variable. Due to more variability in annual growth rates, the study calculated 3 years and 5 years moving average of annual growth rates of foreign aid. Further, both of 3 years and 5 years moving averages of foreign aid showed upward and downward trends over the study period. The moving average trends were presented in the Figure 4.2 below:

Figure 4.2

Moving averages of foreign aid (3 years and 5 years) in Nepal from 1976 to 2020 (in percent)



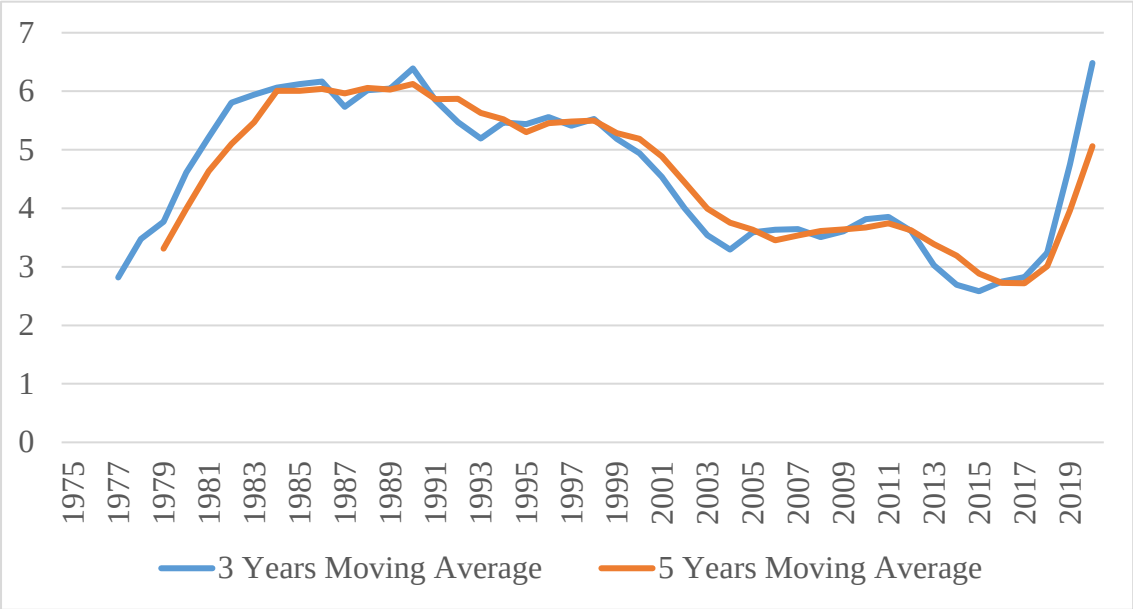
Source: Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal.

4.3 Share of foreign aid in GDP

Another way of analysis is to calculate percentages shares of foreign aid. If the shares of foreign aid in GDP were large and such shares were increased with passage of time, it is evidenced that foreign aid was increasing over the time with an expansion of economy. The average percentage share of foreign aid to GDP was 4.6 percent ranging from 2.3 percent to 8.1 percent. First, the ratios of foreign aid to GDP were calculated and then 3 years and 5 years moving averages were calculated and these moving averages were graphically presented in the Figure 4.3 below.

Figure 4.3

Foreign aid (3- and 5-years moving averages) as a percentage of GDP in Nepal from 1975 to 2020 (in percent)



Source: Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal.

The trend analysis of foreign aid indicated that foreign aid was increased in most of events in Nepal within the study period. The growth rates of foreign aid were volatile and the share of foreign aid to GDP was continuously increasing. Nevertheless, foreign aid was not increasing with planned manner, rather it increased and decreased haphazardly. Nevertheless, the demand for aid changed rampantly over the study period.

4.4 Trend of agriculture sector aid

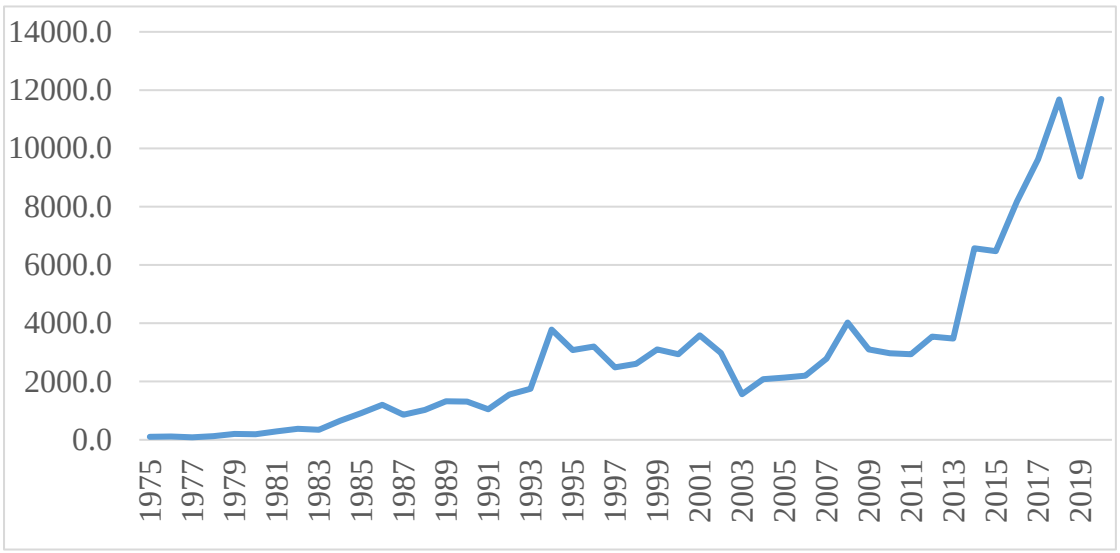
Under the trend of agriculture aid sector in Nepal, volume of agriculture sector aid, growth rate of agriculture sector aid, shares of agriculture sector aid in gross foreign aid and government capital expenditure were described. Higher size of volume of agriculture aid would indicate that large amount of aid is utilized in agriculture sector. Similarly, higher growth rates of agriculture sector aid with lower volatility would show that agriculture sector is regularly consuming increased amount of foreign aid. Further, the large and increasing shares of agriculture sector aid in gross foreign aid and government capital expenditures would indicate that agriculture sector is utilizing

remarkable share in overall foreign aid and such aid is allocated to capital formation in agriculture sector.

The overall agriculture aid is Rs. 128880.9 million within the sampled period. The volume of agriculture aid is increased in 30 fiscal years and it decreased for 16 fiscal years. The trend of volume of agriculture aid shows that it is continuously increasing over the study period. Even though there is upward trend in the volume of agriculture aid, its trend is highly volatile (Figure 4.4).

Figure 4.4

Trend of volume of foreign agriculture sector aid in Nepal from 1975 to 2020 (current prices)



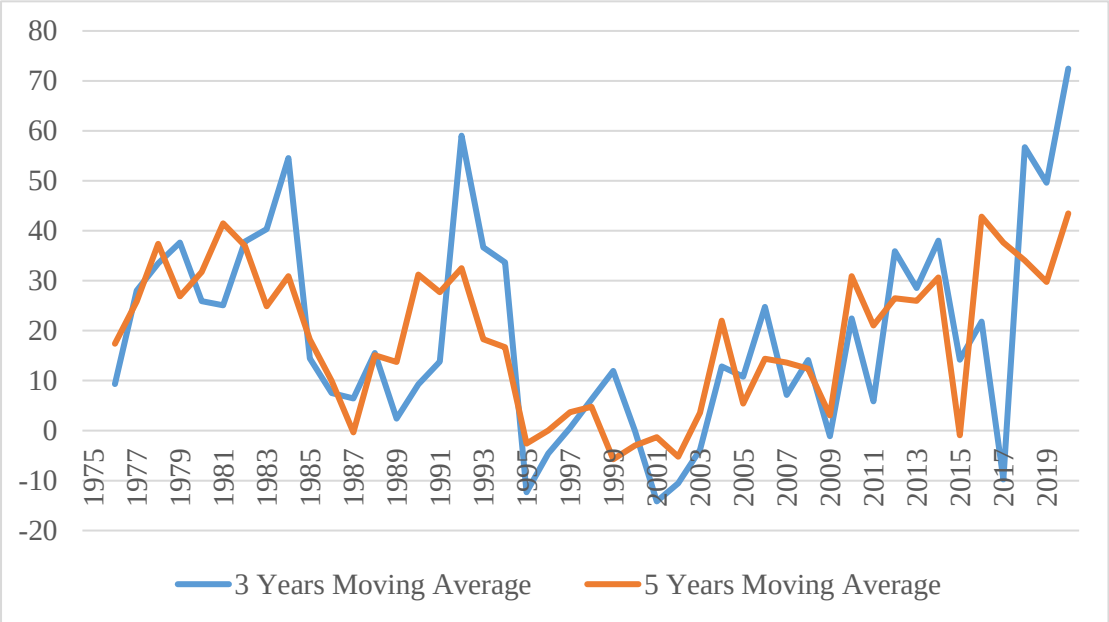
Source: Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal.

The volatile trend line of agriculture aid reflects the reality of economy as the economy affected by different socioeconomic, political, natural and international relations in the study period. Nevertheless, the received foreign aid and the aid utilized in the agriculture sector both were influenced by donor and domestic policies. Such investments are altered according to periodic plans and political changes and the change in the central government. Therefore, agriculture aid volume is unstable over the study period.

The annual growth rates in the volume of agriculture aid reflected clear ups and downs in the volume of agriculture aid. The average annual growth rate of agriculture aid is 15.6 percent over the study period. Annual growth rates were highly volatile. Therefore, 3 years and 5 years moving averages of annual growth rates of foreign aid utilized in agriculture sector were calculated. Both 3 and 5 years moving averages clearly indicated that growth rates of foreign aid utilized in agriculture sector was unstable over the study period. The moving averages of the annual growth rate of agriculture aid are presented in the Figure 4.5.

Figure 4.5

Growth rate of agriculture aid (3 years and 5 years) moving averages in Nepal from 1975 to 2020 (in percent)

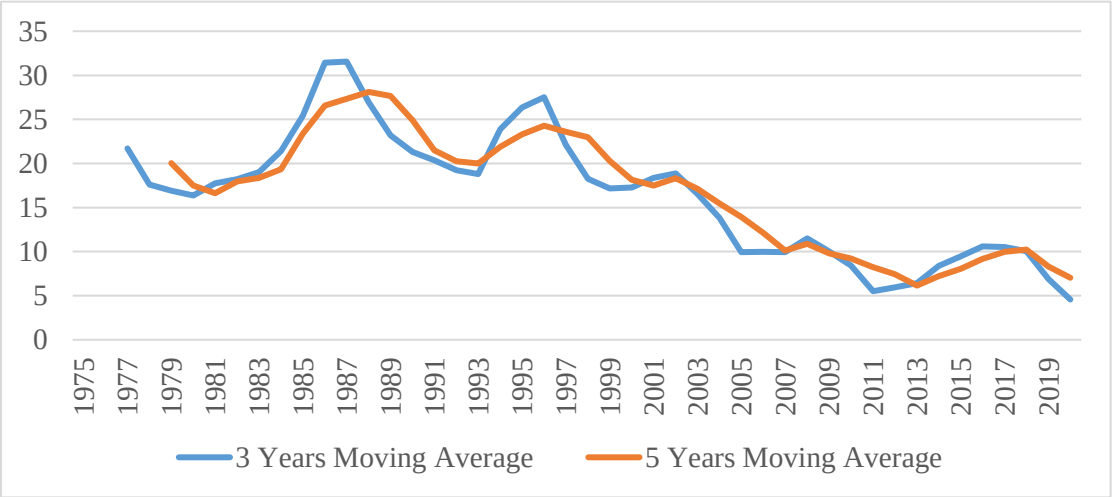


Source: Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal.

Another way of analyzing the trend of agriculture aid are percentages of agriculture aid in overall foreign aid. The average ratio of agriculture aid in overall foreign aid was 9.2 percent respectively. The standard deviations agriculture aid to overall foreign aid was 7.8. The results showed that the share of agriculture aid to overall foreign aid was decreasing over the study period. Due to high degree of variability of agriculture aid to overall foreign aid, 3 and 5 years moving averages were calculated and they are presented in the Figure 4.6.

Figure 4.6

Agriculture aid to overall foreign aid (3 years and 5 years) moving average from 1975 to 2020 in Nepal



Source: Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal.

The trend line of growth in agriculture aid has higher degree of up and downs. Further, the ratios of agriculture aid were decreasing in Nepal. Even though, the trend lines of volume, growth rate and ratios to overall foreign aid show increasing behavior, however such trends are unstable over the study period

4.5 Agriculture sector output in Nepal

GDP comprises of sector wise production in an economy. Similarly total growth rate of an economy depends on sectors wise growth performance. System of National Accounting of Nepal manages three major sectors, namely agriculture, manufacturing and service sectors synonymously as primary, secondary and tertiary sectors.

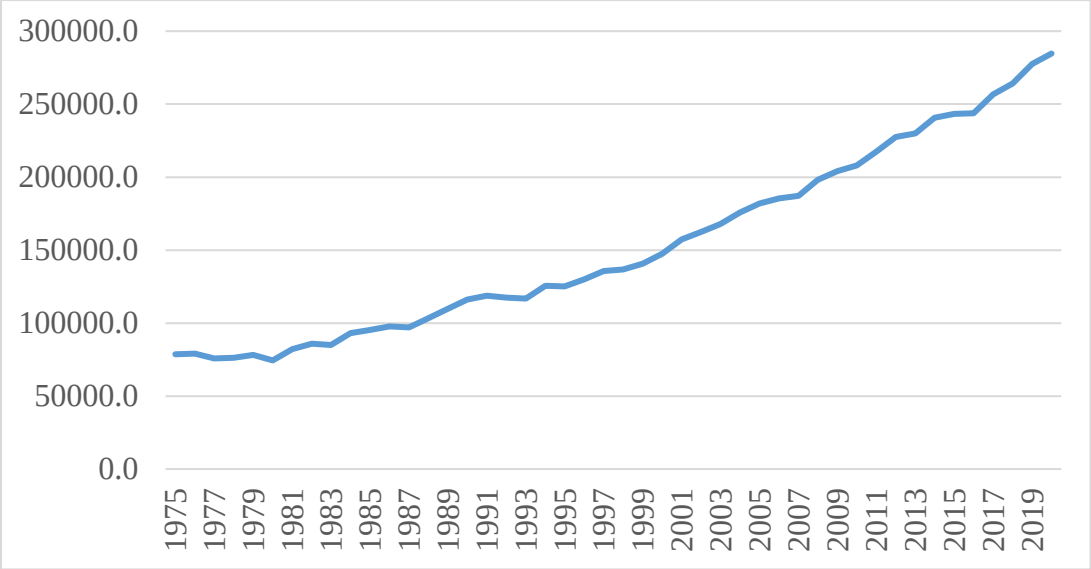
In real terms, the annual volume of agriculture sector output is increased for more episodes. It was increased for 40 annual years out of 46 episodes. Although the volume of real agriculture sector is increased for many fiscal years, the annual increased volume is unstable.

The volume of real agriculture sector output shows that it was increasing over the study period. The real amount of agriculture sector output according to annual series are

increasing as well as decreasing over the study period. Such amounts were increased for more fiscal years and decreased for least fiscal years (Figure 4.7).

Figure 4.7

Size of real agriculture sector output in Nepal from 1975 to 2020 (base year = 2000/01 = 100)

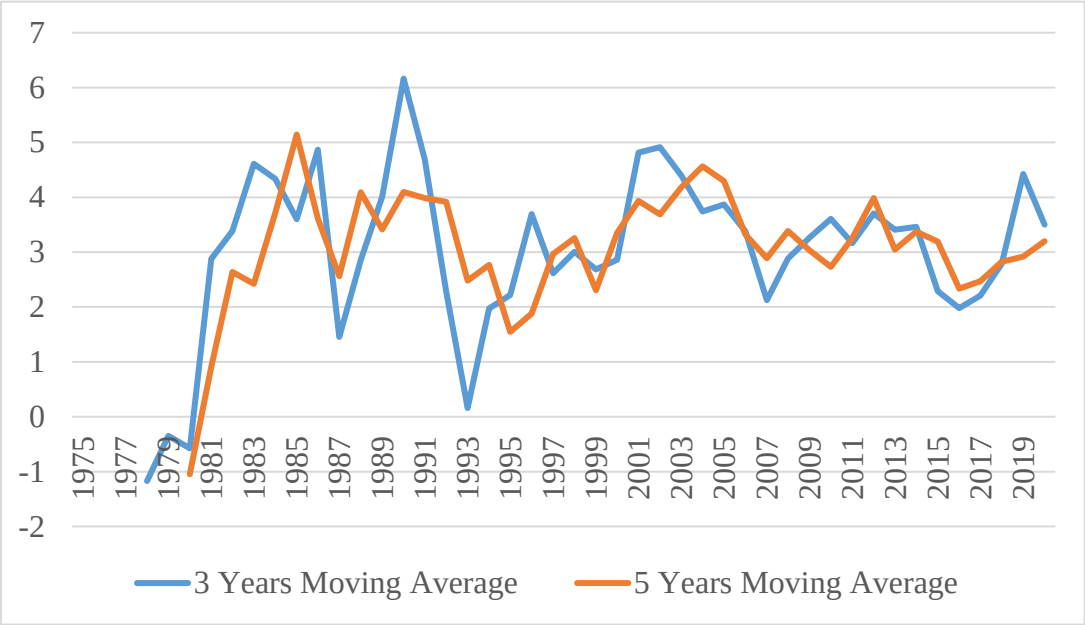


Source: Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal.

The agriculture sector output has very low growth of 2.9 percent with the standard deviation of 3.1 for the study period. The average real annual agriculture sector output is volatile. It has 39 increasing and 7 decreasing events over the whole study period. Due to variability in annual growth episodes, 3 years and 5 years moving averages were calculated and they were presented in Figure 4.8.

Figure 4.8

Growth rate of real agriculture sector output (3 years and 5 years) moving averages in Nepal from 1975 to 2020 (base year = 2000/01 = 100)



Source: Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal.

In conclusion, the trend of foreign agriculture aid and real agriculture sector output shows similar upward and downward trends having large volatility over the study period. Both have unexpected volatile upward and downward trends.

4.6 Trend of other control variables applied as agriculture sector inputs

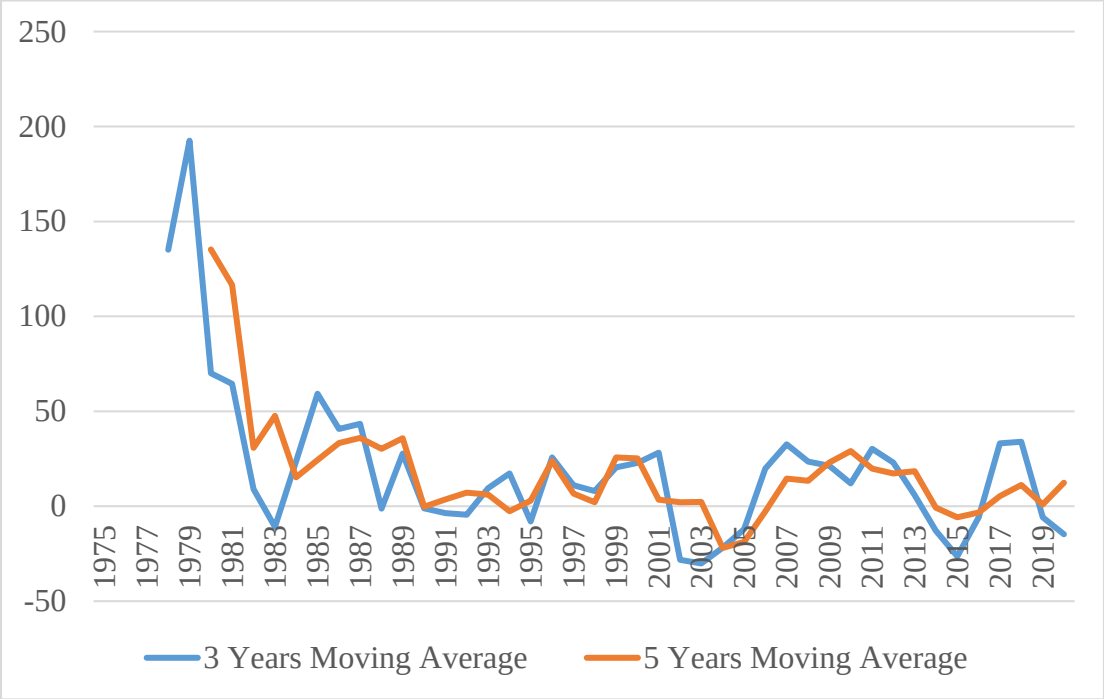
The overall real output of the agriculture sector is not completely explained by the single variable the foreign aid utilized in agriculture sector. Therefore, the study also employs other key variables that have cause and effect relationship on real agriculture sector output. These key inputs include total irrigated land (IRL) (In thousand hectors), imported chemical fertilize (ICF) (In thousand metric ton), gross cultivated land (GCL) (In thousand hectors), agriculture sector credit (ASC) (Rs. in million), government expenditures on agriculture sector (GEXPAS) (Rs. in million) and economically active population in agriculture sector (EAPEAS) (In million).

The size of irrigated land was increased for 25 fiscal years and it was decreased for 21 fiscal years. The annual average growth rate of irrigated land was 22.7 percent over the

whole study period with the standard deviation of 86. The higher value of standard deviation indicated that amount of irrigated land was highly volatile having downward trend over the study period. The time series trend of irrigated land is presented as 3 years moving average and 5 years moving average from 1975 to 2020 in the Figure 4.9.

Figure 4.9

Growth rate of irrigated land (3 years and 5 years) moving averages in Nepal from 1975 to 2020 (in percent)

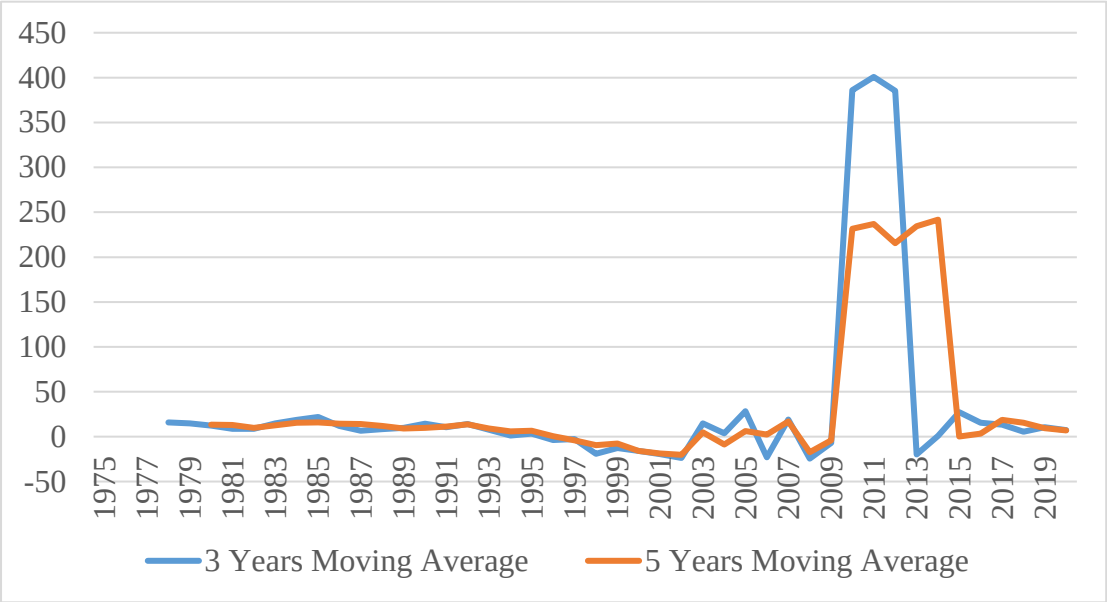


Source: Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal

The size of imported chemical fertilizer was increased for 30 fiscal years and it was decreased for 16 fiscal years. The annual average growth rate of irrigated land was 30.5 percent over the whole study period with the standard deviation of 186.4. The higher value of standard deviation indicated that amount of imported fertilizer was highly volatile having somewhat constant trend except the fiscal years 2010, 2011 and 2012 over the whole study period. In the fiscal years 2010, 2011 and 2012 import of chemical fertilizer was rapidly increased. The time series trend of imported chemical fertilizer is presented as 3 years moving average and 5 years moving average from 1975 to 2020 in the Figure 4.10.

Figure 4.10

Growth rate of imported chemical fertilizer (3 years and 5 years) moving averages in Nepal from 1975 to 2020 (in percent)

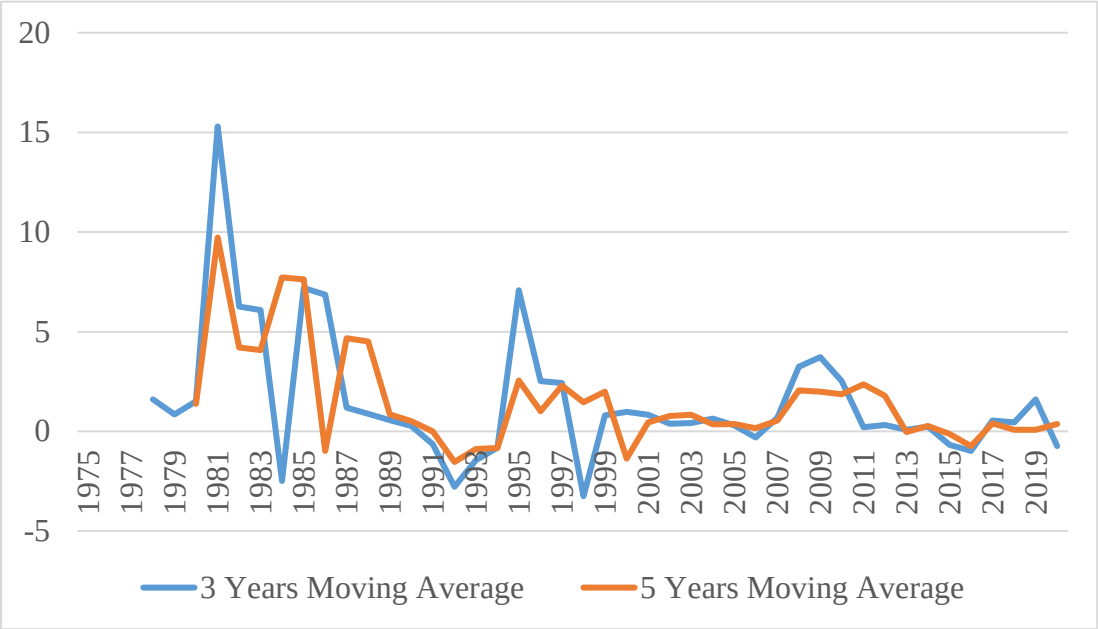


Source: Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal

The size of cultivated land was increased for 30 fiscal years and it was decreased for 16 fiscal years. The annual average growth rate of cultivated land was 1.5 percent over the whole study period with the standard deviation of 8.9. The lower value of standard deviation indicated that amount of cultivated land was stable having downward time trend over the whole study period. The time series trend of cultivated land is presented as 3 years moving average and 5 years moving average from 1975 to 2020 in the Figure 4.11.

Figure 4.11

Growth rate of cultivated land (3 years and 5 years) moving averages in Nepal from 1975 to 2020 (in percent)

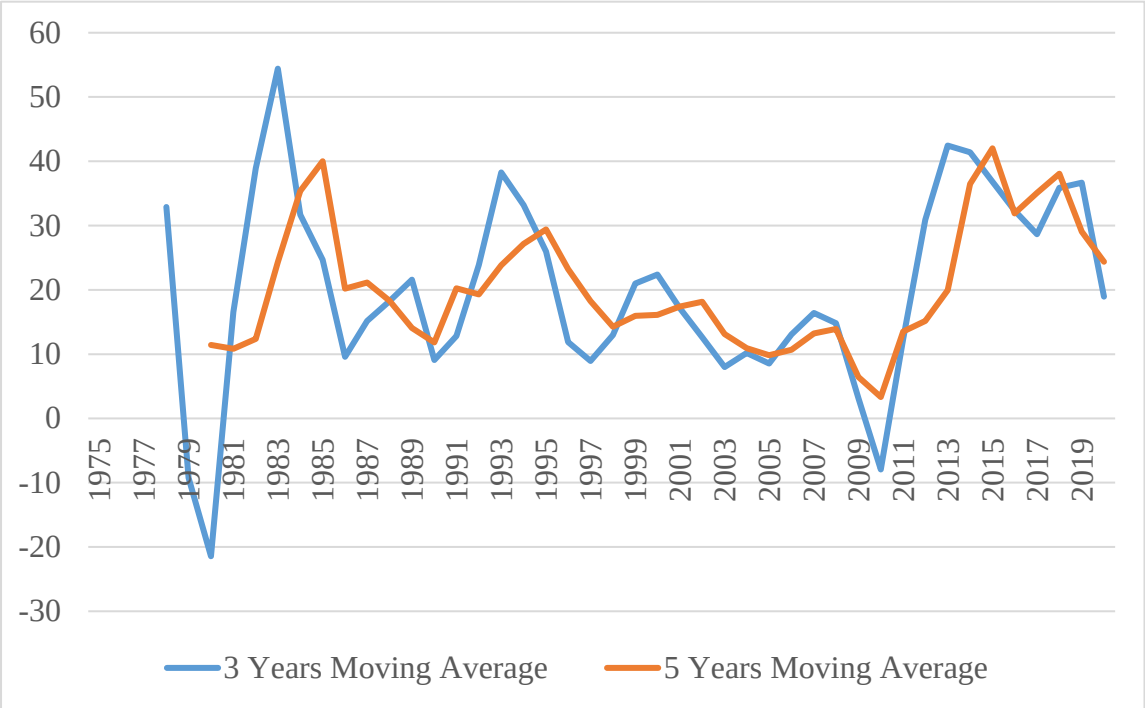


Source: Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal

The size of agriculture sector credit was increased for 39 fiscal years and it was decreased only for 7 fiscal years. The annual average growth rate of agriculture sector credit was 21.0 percent over the whole study period with the standard deviation of 25.9. The value of standard deviation indicated that amount of agriculture sector credit was unstable having both upward and downward time trend over the whole study period. The time series trend of agriculture sector credit is presented as 3 years moving average and 5 years moving average from 1975 to 2020 in the Figure 4.12.

Figure 4.12

Growth rate of agriculture sector credit (3 years and 5 years) moving averages in Nepal from 1975 to 2020 (in percent)

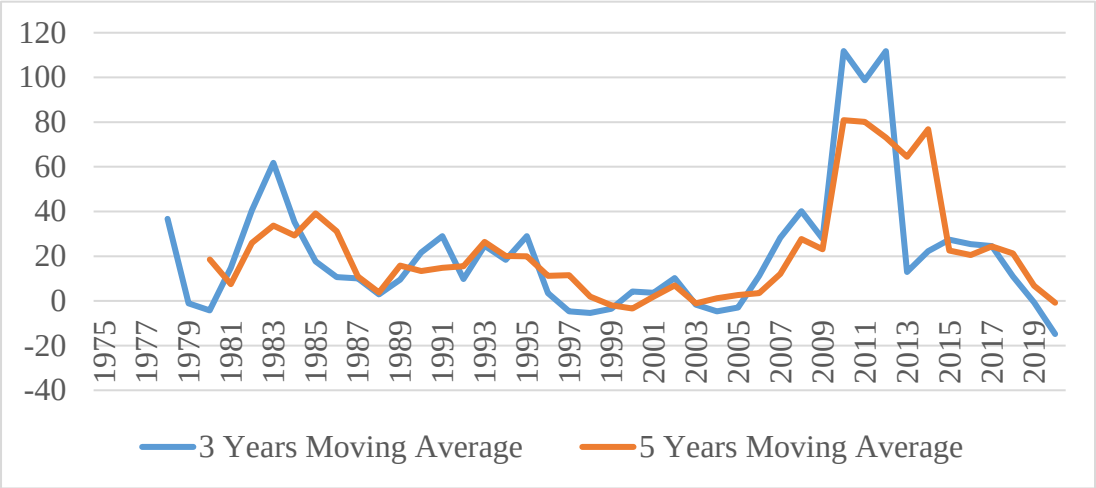


Source: Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal

The size of government expenditures on agriculture sector (less of foreign aid utilized in agriculture sector) was increased for 33 fiscal years and it was decreased only for 13 fiscal years. The annual average growth rate of government expenditures on agriculture sector was 21.4 percent over the whole study period with the standard deviation of 52.7. The value of standard deviation indicated that amount of government was expenditures on agriculture sector unstable having both upward and downward time trend over the whole study period. The time series trend of government expenditures on agriculture sector is presented as 3 years moving average and 5 years moving average from 1975 to 2020 in the Figure 4.13.

Figure 4.13

Growth rate of government expenditure on agriculture sector (3 years and 5 years) moving averages in Nepal from 1975 to 2020 (in percent)

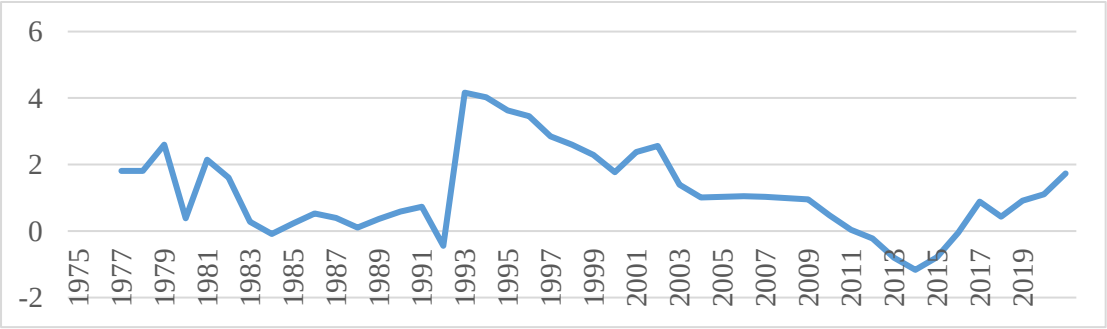


Source: Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal

The size of economically active population employed in agriculture sector was slowly increased increased. The annual average growth rate of economically active population in agriculture sector was 1.2 percent over the whole study period. The time series trend of economically active population employed in agriculture sector is presented in the Figure 4.14.

Figure 4.14

Annual growth rates of economically active population employed in agriculture sector (in percent)



Source: Interpolated and Extrapolated from Population Census Data

CHAPTER V

RELATIONSHIP BETWEEN AGRICULTURE SECTOR AID AND AGRICULTURE SECTOR OUTPUT IN NEPAL

In this section, the study presents the results of the empirical research. It discusses the main empirical findings. The chapter also presents the results of all diagnostic tests carried out in this study and describes the outcome of the test results.

The sub sections describe the relationship between agriculture sector output and agriculture sector foreign aid along with control variables. The subsections presents summary statistics of the variables, correlation between dependent and independent variables, unit root results, cointegration test, regression analysis, and results on serial correlation, heteroscedasticity, multicolinearity, normality and stability test.

5.1 Summary Statistics of Variables

Summary statistics of the dependent and independent variables includes minimum, maximum, mean, standard deviation and coefficient of variation of each variable under study. The whole study period consists of 46 observations.

The results on coefficient of variation of the individual variables shows that GCL, EAPEAS, ICF, RASO and IRL are less varied than the variables of GFAUAS, GCL, ASC, and GEXPAS. The coefficient of variation ranges from 13.9 percent to 200.9 percent. Thus, the variables are both homogenous as well as heterogeneous nature according to the percentage values of coefficient of variation. (Table 5.1).

Table 5.1

Summary statistics of dependent and independent variables at level form of data

Statistics/ Variables	Minimum	Maximum	Average	Standard Deviation	Coefficient of Variation (%)
RASO	74426.7	284664.9	152964.1	63492.1	41.5
GFAUAS	86.6	11698.6	2801.8	2823.2	100.8
IRL	3145.0	53304.0	25419.7	13081.4	51.5
ICF	3157.0	90263.0	35926.5	22732.9	63.3
GCL	2363.0	3955.9	3357.0	467.7	13.9
ASC	114.3	225772.0	28071.8	56386.8	200.9
GEXPAS	97.9	76249.7	11888.7	20505.4	172.5
EAPEAS	5.6	9.4	7.6	1.3	17.6

Source: Researcher's Calculations

5.2 Correlation between dependent and independent variables

Before moving into the cause and effect relationship between dependent and explanatory variables, it would be better to know about their association or strength of relationship. High degree of association between the variables satisfies necessary condition to test the cause and effect relationship of explanatory variables to dependent variable in regression analysis.

The results on partial correlation (Appendix 2) shows that all the independent variables are positively correlated with dependent variable RASO. The explanatory variables GFAUAS, GCL,GEXPAS and EAPEAS are highly (more than 80.0 percent); ASC is moderately (more than 60.0 percent) and IRL and ICF are less correlated (less than 40.0 percent) with the dependent variable RASO. The positive correlation coefficients confirms that there might be cause and effect relationship between the independent variables with dependent variable (Table 5.2).

Table 5.2

Correlation of independent variables with dependent variable RASO

Independent Variables	Correlation Coefficient
GFAUAS	0.83
IRL	0.38
ICF	0.27
GCL	0.84
ASC	0.77
GEXPAS	0.82
EAPEAS	0.92

Source: Researcher's Calculations

5.3 Unit root results

Individual time series data must be stationary before running regression analysis. Otherwise the regression results will be spurious. Therefore, it is better to determine the order of integration of the variables under the study. The Augmented Dickey Fuller (ADF) test (Dickey & Fuller, 1979; Dickey & Fuller, 1981) is used for this purpose both at level and first difference (at once intercept and then intercept and trend). Log level form of data were applied in testing the unit root. The results from log level form of data are presented in Table 5.3.

Table 5.3

ADF Unit Root Results at Log Level Form

Variables	Intercept		Intercept and Trend	
	τ- statistics	p-value	τ- statistics	p-value
LNRASO	0.758340	0.9922	-2.723806	0.2322
LNGFAUAS	-1.859757	0.3477	-2.702551	0.2406
LNIRL	-2.148305	0.3421	-2.873937	0.1215
LNICF	-2.653220	0.1902	-2.702198	0.2407
LNGCL	-2.586305	0.1032	-2.688775	0.1925
LNASC	-0.012180	0.9523	-2.044513	0.1142
LNGEXPAS	-0.893793	0.7812	-2.082059	0.5414
LNEAPEAS	-0.896983	0.7800	-1.921270	0.6266

Source: Researcher's Calculations

The unit root results showed that all variables were suffered unit root at level both at intercept and intercept and trend form. The test statistics and their respective probability clearly indicated that the log level form of individual series was spurious with unit root. Thus, first difference data were employed to test unit root. The unit root results were reported in Table 5.4.

Table 5.4

ADF Unit Root Results at First Difference

Variables	Intercept		Intercept and Trend		Order of Integration
	τ- statistics	p-value	τ- statistics	p-value	
DLNRASO	-7.555692	0.0000	-7.656620	0.0000*	I(1)
DLNGFAUAS	-9.190027	0.0000	-9.246535	0.0000*	I(1)
DLNIRL	-8.348521	0.0000	-8.734365	0.0000*	I(1)
DLNICF	-8.333586	0.0000	-8.252678	0.0000*	I(1)
DLNGCL	-10.10431	0.0000	-10.11203	0.0000*	I(1)
DLNASC	-6.066365	0.0000	-6.137820	0.0000*	I(1)
DLNGEXPAS	-7.489453	0.0000	-7.395499	0.0000*	I(1)
DLNEAPEAS	-6.628860	0.0000	-7.605682	0.0000*	I(1)

Note: An asterisk (*) denotes significant below 1 percent level.
Source: Researcher's Calculations.

The results showed that the log level forms of data at first difference both at intercept and intercept and trend form were completely unit root free and all series were integrated of orders 1. Thus, log level forms of data at first difference were appeared appropriate in employing empirical analysis, particularly empirical model to examine impact of foreign aid utilization in agriculture sector on real agriculture sector output.

5.4 Cointegration test results

After testing the stationary of the variables, the study looked at the cointegration among the variables where Johannsen cointegration test (Johansen, 1988, 1991; Johansen & Juselius, 1990) is applied with log level form of data. Eviews 10 based on AIC criterion automatically selects 7 legs. The results for the test are presented in Table 5.5.

Table 5.5

Cointegration test results of rank test of (trace)

Unrestricted Cointegration Rank Test (Maximum Eigenvalues)				
Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.851611	255.7406	159.5297	0.0000
At most 1 *	0.758260	171.7921	125.6154	0.0000
At most 2 *	0.579096	109.3168	95.75366	0.0042
At most 3 *	0.464401	71.24131	69.81889	0.0383
At most 4	0.328730	43.76905	47.85613	0.1149
At most 5	0.296717	26.23136	29.79707	0.1219
At most 6	0.206895	10.74353	15.49471	0.2277
At most 7	0.012295	0.544354	3.841466	0.4606

Trace test indicates 4 cointegrating equation(s) at the 0.05 level

An asterisk (*) denotes rejection of the hypothesis below at the 0.05 level

Source: Researcher's Calculations

The study looked at the trace statistics and the corresponding p-value to confirm the cointegration results. The results established that there is at least one cointegration equation, suggesting that, in the long run the real agriculture sector output and overall explanatory variables move together and there would be equilibrium point among them.

5.5 Regression results

The empirical results on the basic model which explore nexus between real agriculture sector output and foreign aid utilized in agriculture sector (Appendix 2**)** in Nepal are given in the Table 5.6.

Table 5.6

Regression results $\Delta\, ln$ RASO as dependent variable

Variables	Coefficients	Standard Errors of Coefficients	t-statistics	P-value
DLNGFAUAS	0.164530	0.022465	7.323837	(0.0000)*
DLNIRL	0.115329	0.013970	8.255476	(0.0006)**
DLNICF	0.139098	0.013899	10.00770	(0.0030)**
DLNASC	0.103892	0.013266	7.831448	(0.0000)*
DLNGCL	0.168486	0.110665	1.522494	(0.1162)***
DLNGEXPAS	0.127882	0.016074	7.955829	(0.0001)**
DLNEAPEAS	0.565021	0.156544	3.609336	(0.0009)**
Constant	8.633851	0.823773	10.48087	(0.0000)*
R^2 = 0.89 Adjusted R^2 = 0.88		DW = 1.98 N = 45 after adjustments F= 1506.93 Probability of F statistics = (0.0000)**		

*Notes: The symbols in p-value (the asterisks) *, ** and *** denote the statistical significance at the 1 percent, 5 percent levels, and 15 percent levels respectively.*
Source: Researcher's Calculations.

The variables GFAUAS, ASC, and constant term are significant at 1 percent level and other variables IRL, ICF, GEXPAS and EAPEAS are significant at 5 percent level. The only variable GCL is significant at 15 percent level. The adjusted coefficient of determination ($Adj.R^2$) is 88.0 percent. The F-statistics, which shows the overall fitness of the model, is statistically significant at 1 percent level of significance.

The DW statistics is very near to 2 (1.98) indicating that the equation may be free from autocorrelation. However, Breusch Pagan-Godfrey Serial Correlation LM Test is conducted to test the autocorrelation as well as its order (Table 5.7).

Table 5.7

Breusch Pagan-Godfrey Serial Correlation LM Test

Lags	Chi2 value	Df	Prob > Chi2
1	7.8953	1	0.4978
2	11.5843	1	0.7136

Source: Researcher's Calculation.

The observed R-squared statistics at lag 1 and lag 2 are 7.8953 and 11.5843 with the probability of 49.78 percent and 71.36 percent respectively. The LM statistics show that the null hypothesis of no serial correlation at lag 1 and lag 2 cannot be rejected. Hence, the residuals are not serially correlated.

Generally, time series data did not produce heterocedasticity. However, the study tested heterocedasticity of error terms applying Breusch-Pagan-Godfrey test of heteroscedasticity. Breusch-Pagan-Godfrey test of heteroscedasticity of the variance of error terms from agriculture real output equation shows that the observed R squared statics is 13.90 with the probability of 45.25 percent. These results indicated that the residuals are homoscedastic.

The study has taken foreign aid utilized in agriculture sector along with irrigated land, cultivated land, imported chemical fertilizer, agriculture sector credit, government expenditures in agriculture sector less foreign aid in agriculture sector and economically active population employed in agriculture sector. There is suspicion that the explanatory variables are highly correlated to each other because foreign aid utilized in agriculture sector is utilized for irrigation projects, agriculture credit and imports of chemical fertilizer. Therefore, multicolliearity test of Variance Inflation Factor (VIF) test is conducted. The results are presented in the Table 5.8.

Table 5.8

Multicolinearity VIF test results

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
LNIRL	0.000196	405.9251	1.950938
LNICF	0.000194	426.3240	2.312275
LNGEXPAS	0.000259	350.0300	3.89336
LNGCL	0.012299	16814.19	4.023237
LNEAPEAS	0.024610	2098.687	3.35263
LNASC	0.000544	848.7248	3.78479

Source: Researcher's Calculation

The VIF centered values of the estimated equation are below 5. It infers that independent variable are not correlated to that level which makes the results incorrect. Thus, there is no problem of multicollinearity.

The result of the Jarque-Bera (J-B) statistics showed that J-B is 3.75 having probability value of 63.5 percent. As the probability value is reasonably high, the residuals are normally distributed because null hypothesis cannot be rejected. It means that residuals are normally distributed.

5.6 Discussion of the results

The coefficient of ΔLNRFAUAS is 0.16 and it depicts that 1 percent point increase in the growth rate of foreign aid utilized in agriculture sector increases the growth rate of real agriculture sector output by 0.16 percent point. The coefficient of ΔLNRFAUAS is positive and significant, meaning that increase in the growth rate of the foreign aid utilized in agriculture sector increases real agriculture sector output in Nepal. The positive and significant coefficient conforms that foreign aid utilized in agriculture sector causes the real agriculture sector output to increase.

The coefficient of ΔLNIRL is 0.12 and it depicts that 1 percent point increase in the growth rate of irrigated land increases the growth rate of real agriculture sector output by 0.12 percent point. The coefficient of ΔLNIRL is positive and significant, meaning that increase in the growth rate of irrigated land increases real agriculture sector output in Nepal. The positive and significant coefficient conforms that increase in irrigated land causes the real agriculture sector output to increase.

The coefficient of ΔLNICF is 0.14 and it depicts that 1 percent point increase in the growth rate of imported chemical fertilizer increases the growth rate of real agriculture sector output by 0.14 percent point. The coefficient of ΔLNICF is positive and significant, meaning that increase in the growth rate of imported chemical fertilizer increases real agriculture sector output in Nepal. The positive and significant coefficient conforms that increase in imported chemical fertilizer causes the real agriculture sector output to increase.

The coefficient of ΔLNASC is 0.14 and it depicts that 1 percent point increase in the growth rate of agriculture sector credit increases the growth rate of real agriculture sector output by 0.14 percent point. The coefficient of ΔLNASC is positive and significant, meaning that increase in the growth rate of agriculture sector credit increases real agriculture sector output in Nepal. The positive and significant coefficient conforms that increase in agriculture sector credit causes the real agriculture sector output to increase.

The coefficient of ΔLNGCL is 0.17 and it depicts that 1 percent point increase in the growth rate of gross cultivated land out of overall cultivated land increases the growth rate of real agriculture sector output by 0.17 percent point. The coefficient of ΔLNGCL

is positive and significant, meaning that increase in the growth rate of gross cultivated land increases real agriculture sector output in Nepal, however it is significant at 15 percent level. The positive and significant coefficient conforms that increase in gross cultivated land causes the real agriculture sector output to increase.

The coefficient of ΔLNGEXPAS is 0.13 and it depicts that 1 percent point increase in the growth rate of government expenditure in agriculture sector increases the growth rate of real agriculture sector output by 0.13 percent point. The coefficient of ΔLNGEXPAS is positive and significant, meaning that increase in the growth rate of government expenditure in agriculture sector increases real agriculture sector output in Nepal. The positive and significant coefficient conforms that increase in government expenditure in agriculture sector causes the real agriculture sector output to increase.

The coefficient of ΔLNEAPEAS is 0.57 and it depicts that 1 percent point increase in the growth rate of economically active population in agriculture sector increases the growth rate of real agriculture sector output by 0.57 percent point. The coefficient of ΔLNEAPEAS is positive and significant, meaning that increase in the growth rate of economically active population in agriculture sector increases real agriculture sector output in Nepal. The coefficient is significantly large. It indicated that the role of agriculture or farm labor has specific role in real agriculture sector output. The positive and significant coefficient conforms that increase in economically active population in agriculture sector causes the real agriculture sector output to increase.

The study purposed the hypothesis that foreign aid utilized in agriculture sector has positive and significant impact on real agriculture sector output. The empirical results as well as the econometric diagnostic tests support it. It confirms that foreign aid centered to agriculture sector development is contributing to real agriculture sector output. The results are in line with the earlier studies such as Kherallah, Beghin, Peterson & Ruppel, 1994; Dewbre, Thompson & Dewbre, 2007; Kaya, Kaya & Gunter, 2013; Alabi, 2014; and Verter, 2017. Foreign aid of several forms to agricultural development is providing foreign exchanges for the importation of agricultural inputs, capital for development projects, local currency allocations to the agricultural sector, and technical assistance activities. Agriculture aid is strengthening the yield output by improving the social and economic infrastructure in the agricultural sector and it is

helping to build the basic institutions and developing the human skills required for sustained economic growth in agriculture sector.

The empirical results also revealed that increase in irrigated land, imported chemical fertilizer, agriculture sector credit, gross cultivated land, government expenditure in agriculture sector and economically active population in agriculture sector have positive and significant impact on real agriculture sector output. The results are also in line with the earlier studies such as Kherallah, Beghin, Peterson & Ruppel, 1994; Dewbre, Thompson & Dewbre, 2007; Kaya, Kaya & Gunter, 2013; Alabi, 2014; and Verter, 2017. It supports the theories that increase in investment in inputs would result into increase in real output. Therefore, to increase real agriculture sector output, size and quality of agriculture inputs such as irrigated land, chemical fertilizer, agriculture sector credit, gross cultivated land, government expenditure in agriculture sector and economically active population in agriculture sector should be enlarged. Based on the overall results, it confirms that foreign aid utilized in agriculture sector, extension of irrigation and credit facilities, enlargement of cultivated area, chemical fertilizer availability and agriculture sector manpower increase real agriculture sector output in Nepal.

CHAPTER VI
SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This chapter concludes our study and it is divided into four major sections. Overall findings are presented in section 6.1. In section 6.2, conclusions are drawn. Policy recommendations are delineated in section 6.3.

6.1 Summary of findings

This study attempted to empirically investigate the effect of foreign aid utilized in agriculture sector along with other key inputs to agriculture sector. The general objective of the study was to analyses the efficacy of foreign aid in the growth of agriculture sector output in Nepal. The specific objectives are:

i. To trace out the trend of gross foreign aid utilized in agricultural sector and real gross agriculture sector output,
ii. To examine the relationship between gross foreign aid utilized in agriculture sector and real gross agriculture sector output.

The study is very important to macroeconomists, academicians and policy makers in understanding the responsiveness of real agriculture sector output and foreign aid utilized in agriculture sector.

The OLS technique is utilized to estimate the relationships between real agriculture sector output as dependent and foreign aid utilized in agriculture sector, gross irrigated land, imported chemical fertilizer, agriculture sector credit, gross cultivated land, government expenditure in agriculture sector and economically active population in agriculture sector as independent variables. The variables take time series data from 1975 to 2020. Various econometric tools are used for ensuring the robustness of the models as well as derived coefficients. Summary statistics, partial correlation, and unit root test are carried out along with t, F, R- squared, adjusted R-squared and DW statistics are conducted. Serial correlation, hetoroscedastcity, multicollinearity and normality of the error terms are carried out to detect parsimony in coefficients to check

either classical assumption on error terms holds or not. The major findings are listed in the following bullets:

- The volume of foreign aid is both increasing and decreasing over the study period. Foreign aid was increased in 38 fiscal years and it was decreased in the 8 fiscal years, i.e. 1987, 1991, 1995, 1999, 2002, 2006, 2012 and 2013. The annual growth rates of foreign aid had 22 upward and 23 downward trends within the whole study period. The average growth rate of foreign aid was 17.8 percent with the standard deviation of 22.0 percent. The average percentage share of foreign aid to GDP was 4.6 percent ranging from 2.3 percent to 8.1 percent.
- The overall agriculture aid is Rs. 128880.9 million within the sampled period. The volume of agriculture aid is increased in 30 fiscal years and it decreased for 16 fiscal years. The trend of volume of agriculture aid shows that it is continuously increasing over the study period. The average annual growth rate of agriculture aid is 15.6 percent over the study period. Annual growth rates were highly volatile. The average ratio of agriculture aid in overall foreign aid was 9.2 percent respectively. The standard deviations agriculture aid to overall foreign aid was 7.8.
- The agriculture sector output has very low growth of 2.9 percent with the standard deviation of 3.1 for the study period. It has 39 increasing and 7 decreasing events over the whole study period.
- The size of irrigated land was increased for 25 fiscal years and it was decreased for 21 fiscal years. The annual average growth rate of irrigated land was 22.7 percent over the whole study period with the standard deviation of 86.
- The size of imported chemical fertilizer was increased for 30 fiscal years and it was decreased for 16 fiscal years. The annual average growth rate of irrigated land was 30.5 percent over the whole study period with the standard deviation of 186.4.
- The size of cultivated land was increased for 30 fiscal years and it was decreased for 16 fiscal years. The annual average growth rate of cultivated land was 1.5 percent over the whole study period with the standard deviation of 8.9.
- The size of agriculture sector credit was increased for 39 fiscal years and it was decreased only for 7 fiscal years. The annual average growth rate of agriculture

sector credit was 21.0 percent over the whole study period with the standard deviation of 25.9.

- The size of government expenditures on agriculture sector (less of foreign aid utilized in agriculture sector) was increased for 33 fiscal years and it was decreased only for 13 fiscal years. The annual average growth rate of government expenditures on agriculture sector was 21.4 percent over the whole study period with the standard deviation of 52.7.
- The size of economically active population employed in agriculture sector was slowly increased increased. The annual average growth rate of economically active population in agriculture sector was 1.2 percent over the whole study period.
- The results on coefficient of variation of the individual variables shows that GCL, EAPEAS, ICF, RASO and IRL are less varied than the variables of GFAUAS, GCL, ASC, and GEXPAS. The coefficient of variation of all the variables range from 13.9 percent to 200.9 percent. Thus, the variables are of both homogenous and heterogeneous nature.
- All the variables are positively correlated with independent variable. The explanatory variables GFAUAS, GCL,GEXPAS and EAPEAS are highly (more than 80.0 percent); ASC is moderately (more than 60.0 percent) and IRL and ICF are less correlated (less than 40.0 percent) with the dependent variable RASO.
- The unit root results show that all variables are suffered unit root at log level and the first difference data at log level are completely unit root free.
- The cointegration test results supported that there is long run relationship between the variables.
- The coefficient of ΔLNRFAUAS is 0.16 and it depicts that 1 percent point increase in the growth rate of foreign aid utilized in agriculture sector increases the growth rate of real agriculture sector output by 0.16 percent point. The coefficient of ΔLNRFAUAS is positive and significant, meaning that increase in the growth rate of the foreign aid utilized in agriculture sector increases real agriculture sector output in Nepal.
- The coefficient of ΔLNIRL is 0.12 and it depicts that 1 percent point increase in the growth rate of irrigated land increases the growth rate of real agriculture

sector output by 0.12 percent point. The coefficient of ΔLNIRL is positive and significant, meaning that increase in the growth rate of irrigated land increases real agriculture sector output in Nepal.

- The coefficient of ΔLNICF is 0.14 and it depicts that 1 percent point increase in the growth rate of imported chemical fertilizer increases the growth rate of real agriculture sector output by 0.14 percent point. The coefficient of ΔLNICF is positive and significant, meaning that increase in the growth rate of imported chemical fertilizer increases real agriculture sector output in Nepal.
- The coefficient of ΔLNASC is 0.14 and it depicts that 1 percent point increase in the growth rate of agriculture sector credit increases the growth rate of real agriculture sector output by 0.14 percent point. The coefficient of ΔLNASC is positive and significant, meaning that increase in the growth rate of agriculture sector credit increases real agriculture sector output in Nepal.
- The coefficient of ΔLNGCL is 0.17 and it depicts that 1 percent point increase in the growth rate of gross cultivated land out of overall cultivated land increases the growth rate of real agriculture sector output by 0.17 percent point. The coefficient of ΔLNGCL is positive and significant, meaning that increase in the growth rate of gross cultivated land increases real agriculture sector output in Nepal, however it is significant at 15 percent level.
- The coefficient of ΔLNGEXPAS is 0.13 and it depicts that 1 percent point increase in the growth rate of government expenditure in agriculture sector increases the growth rate of real agriculture sector output by 0.13 percent point. The coefficient of ΔLNGEXPAS is positive and significant, meaning that increase in the growth rate of government expenditure in agriculture sector increases real agriculture sector output in Nepal.
- The coefficient of ΔLNEAPEAS is 0.57 and it depicts that 1 percent point increase in the growth rate of economically active population in agriculture sector increases the growth rate of real agriculture sector output by 0.57 percent point. The coefficient of ΔLNEAPEAS is positive and significant, meaning that increase in the growth rate of economically active population in agriculture sector increases real agriculture sector output in Nepal. The coefficient is significantly large. It indicated that the role of agriculture or farm labor has specific role in real agriculture sector output.

6.2 Conclusions

Nepal is an agrarian country facing continuous resource deficit. Hence, the government of Nepal continuously inviting foreign aid, particularly focusing to grants. Foreign aid is continuously increasing. Nevertheless, foreign aid is unstable in Nepal. Being an agrarian economy, most of the aid received resources are channeled to primary agriculture sector. Even though agriculture sector is utilizing remarkable share of gross foreign aid, the real output of agriculture sector is stagnant over the years. Further, foreign aid utilized in agriculture sector is more volatile and more dependent on fair monsoon. Agriculture inputs such as irrigation facilities, chemical fertilizer, agriculture sector credit, cultivation land, government expenditures to agriculture sector as well as economically active population in farming occupation are also increasing over the study period having volatile trend.

The study finds that the share of aid utilized in agriculture sector is advantageous to enlarge agriculture sector output along with key agriculture sector inputs. The role of increase in irrigated land, imported chemical fertilizer, agriculture sector credit, gross cultivated land, government expenditure in agriculture sector and economically active population in agriculture sector is positive in increasing real agriculture sector output. Therefore, the study concludes that foreign aid utilized in agriculture sector along with other key inputs to agriculture sector contributing in the domestic economy and these variables should be increased keeping them stable to increase real output of agriculture sector in Nepal.

6.3 Recommendations

Based on the above descriptive and econometric analysis, the following recommendations are prescribed:

i. Foreign aid utilized in agriculture sector has positive impact in augmenting output of the agriculture sector. The results of this study has ruled out the controversies that government investments channel to agricultural development activities is not contributing to the output of agriculture sector. Thus, it is recommended that government should increase agriculture inputs encouraging greater foreign aid to agriculture sector.

ii. The agriculture inputs variables- irrigated land, imported chemical fertilizer, agriculture sector credit, gross cultivated land, government expenditure to agriculture sector and economically active population in agriculture sector have positive contribution on real agriculture sector output. Thus, it is recommended that government should formulate the policies that should channel agricultural sector resources to irrigated land, imported chemical fertilizer, agriculture sector credit, gross cultivated land, government expenditure to agriculture sector and economically active population.

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APPENDIX 1

EMPIRICAL DATA USED IN THE ANALYSIS

FY	RASO	GFAUSA	IRL	ICF	GCL	ASC	GEXPAS	EAPEAS
1975	78627.0	103.4	3145.0	11243.0	2363.0	114.3	97.9	5.572014
1976	79069.5	115.4	3651.0	12266.0	2412.0	222.0	212.6	5.672617
1977	75842.7	86.6	20093.0	14884.0	2420.0	282.5	188.1	5.775049
1978	76123.9	122.4	7840.0	17467.0	2478.0	218.0	196.2	5.925267
1979	78150.5	205.2	22597.0	18543.0	2474.0	147.9	203.9	5.948098
1980	74426.7	187.6	41274.0	20964.0	2530.0	134.1	161.1	6.075911
1981	82139.7	288.6	9375.0	22458.0	3638.0	256.4	260.4	6.173571
1982	85883.8	382.4	11388.0	23817.0	2646.0	345.8	471.7	6.190711
1983	84944.4	340.0	14025.0	31279.0	2692.0	474.3	673.1	6.185174
1984	93045.3	652.8	17715.0	37299.0	3178.0	583.8	552.3	6.199649
1985	95237.4	914.6	40477.0	42829.0	3235.0	663.8	707.9	6.232682
1986	97810.7	1203.4	27231.0	43408.0	3259.0	610.8	862.8	6.257165
1987	97128.6	863.0	36572.0	45051.0	3292.0	854.0	690.0	6.263482
1988	103497.0	1029.6	34602.0	54181.0	3322.0	1049.5	737.9	6.286241
1989	109878.0	1321.4	53304.0	56839.0	3314.0	1070.7	1046.0	6.323029
1990	116213.0	1308.6	25666.0	67286.0	3318.0	1095.3	1215.1	6.369114
1991	118715.0	1044.9	22288.0	72719.0	3258.0	1469.0	1567.6	6.341093
1992	117451.0	1555.7	33833.0	84391.0	3041.0	1985.3	1316.4	6.605037
1993	116723.0	1752.0	30405.0	83331.0	3167.0	2887.9	2122.8	6.871077
1994	125598.0	3778.6	33542.0	73812.0	3168.0	3433.7	2337.2	7.120147
1995	125180.0	3085.5	25372.0	90263.0	3708.0	3896.8	2702.6	7.366174
1996	129951.0	3199.8	48530.0	70154.0	3355.0	4023.4	2292.1	7.575725
1997	135621.0	2484.5	32018.0	64150.0	3346.0	4430.1	1964.7	7.772268
1998	136776.0	2606.8	21447.0	47010.0	3347.0	5562.4	2225.1	7.950564
1999	140660.0	3104.9	49015.0	45669.0	3436.0	7084.7	2014.8	8.091411
2000	147543.0	2940.4	35702.0	37250.0	3444.0	8089.8	2189.0	8.283612
2001	157442.0	3590.2	29661.0	23623.0	3430.5	8888.9	2440.7	8.495484
2002	162398.0	2976.1	17587.0	19713.0	3475.4	10115.2	2696.3	8.614316
2003	167801.0	1562.9	11823.0	38950.0	3487.4	10148.9	1971.0	8.701155
2004	175765.0	2077.1	12753.0	11771.0	3497.2	11817.0	2016.2	8.790379
2005	181979.0	2137.6	11325.5	18458.0	3507.2	12855.6	2334.7	8.882882
2006	185363.0	2196.6	18402.0	8136.0	3455.7	14650.2	2702.9	8.974691
2007	187179.0	2785.2	26967.5	12751.0	3567.5	18530.0	4140.4	9.063447
2008	198072.0	4030.3	16613.0	3285.0	3850.94	19260.0	6269.65	9.150132
2009	203994.6	2009.0	25850.0	3157.0	3850.4	15240.0	4957.9	9.193207
2010	208101.8	2969.7	30718.0	42178.0	3835.5	14192.0	20074.3	9.197038
2011	217423.6	2941.5	35748.0	29604.0	3874.3	23407.3	22512.2	9.176579
2012	227499.9	3545.5	47795.0	14565.3	3887.6	31531.0	26607.4	9.102805
2013	230018.0	3472.0	32180.0	17695.3	3844.66	40270.1	28853.9	8.996656
2014	240681.2	6571.3	19310.0	23319.8	3901.33	65160.0	40462.8	8.925686
2015	243371.2	6474.1	18083,0	29867.7	3807.13	78791.0	53967.9	8.921605
2016	243824.3	8171.6	23263.0	25891.39	3731.33	90041.0	55451.4	9.000394
2017	256771.8	9628.3	41180.0	32497.74	3955.85	135757.0	76249.7	9.03919
2018	264147.4	11679.1	39669.0	34014.5	3848.85	193457.0	70692.2	9.122234
2019	277613.5	3686.1	3705.0	34522.7	3906.29	225772.0	47933.2	9.222778
2020	284664.9	11698.6	5567.0	40054.1	3867.63	220432.0	45536.5	9.382276

1. **Real Agriculture Sector Output (RGASO) (Rs. in million) and Nominal GDP:** Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, National Accounts of Nepal, Ministry of Finance, Government of Neal and Reports on National Accounts of Nepal, 2016, 2017, 2019 and 2020, Central Bureau of Statistics, National Planning Commission Secretariats, Government of Nepal.
2. **Foreign Aid Utilized in Agriculture Sector (GFAUAS) (Rs. in million) (Grants plus Loan):** Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal.
3. **Imported Chemical Fertilizer (ICF) (In Thousand Metric ton):** Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal.
4. **Addition Irrigated Land (IRL) (In thousand Hectors):** Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal.
5. **Gross Cultivated Land (GCL) (In Thousand Hectors.) (Cereals plus cash crops):** Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal.
6. **Agriculture Sector Credit (ACS) (In Rs. Million):** Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal.
7. **Government Expenditures in Agriculture Sector (ASC) (In Rs. Million):** Economic Survey Reports, 2009/10, 2011/12, 2019/20 and 2021, Ministry of Finance, Government of Nepal.
8. **Economically Active Population in Agriculture Sector (EAPEAS) (In million):** Interpolated and Extrapolated based on census data points of Census Reports, 1971, 1981, 1991, 2001 and 2011, Central Bureau of Statistics, National Planning Commission Secretariats, Government of Nepal.

APPENDIX 2

EMPIRICAL RESULTS

Partial Correlation between Dependent and Independent Variables

Covariance Analysis: Ordinary
Date: 01/25/22 Time: 12:21
Sample: 1975 2020
Included observations: 46

Correlation	RASO	GFAUSA	IRL	ICF	GCL	ASC	GEXPAS	EAPEAS
RASO	1.000000							
GFAUSA	0.826184	1.000000						
IRL	0.378060	0.119652	1.000000					
ICF	0.273853	-0.006047	0.383011	1.000000				
GCL	0.835068	0.655836	0.216946	0.028809	1.000000			
ASC	0.769394	0.815773	0.137699	0.095954	0.506103	1.000000		
GEXPAS	0.819026	0.871269	0.054340	0.132484	0.584615	0.860316	1.000000	
EAPEAS	0.923046	0.685198	0.056101	0.260927	0.838125	0.536534	0.588624	1.000000

Regression Results

Dependent Variable: LNRASO
Method: Least Squares
Date: 01/26/22 Time: 13:11
Sample: 1975 2020
Included observations: 45 (after adjustments)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGFAUAS(1)	0.164530	0.022465	7.323837	0.0000
LNIRL(1)	0.115329	0.013970	8.255476	0.0006
LNICF(1)	0.139098	0.013899	10.00770	0.0030
LNASC(1)	0.103892	0.013266	7.831448	0.0000
LNGCL(1)	0.168486	0.110665	1.522494	0.1162
LNGEXPAS(1)	0.127882	0.016074	7.955829	0.0001
LNEAPEAS(1)	0.565021	0.156544	3.609336	0.0009
C	8.633851	0.823773	10.48087	0.0000

R-squared	0.891405	Mean dependent var	11.85297
Adjusted R-squared	0.880453	S.D. dependent var	0.419071
S.E. of regression	0.046941	Akaike info criterion	-3.123064
Sum squared resid	0.083733	Schwarz criterion	-2.805039
Log likelihood	179.83047	Hannan-Quinn criter.	-3.003930
F-statistic	1506.9359	Durbin-Watson stat	1.981308
Prob(F-statistic)	0.000000		