

## Contribution of Agriculture Sector to the Tanzanian Economy

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### Abstract

This paper was undertaken to estimate the contribution of the agriculture sector to the Tanzanian economy. The study focused on time series data collected for the period of thirty years (1981 - 2010) in Tanzania Mainland. However, the Mean Model was employed to estimate the contribution of agriculture sector to the Tanzanian economy. Moreover, the significant contribution of crops, livestock and fisheries subsectors to the Agriculture Gross Domestic Product (AgGDP) was calibrated by a Multiple Regression Model. The empirical study revealed that agriculture sector is the key contributor to the national economy by accounting 25.88% of the national economy, contributed by crops subsector (18.93%); livestock subsector (4.70%) and fisheries subsector (2.25%), respectively. This contribution makes the agriculture sector to be the second largest sector to contribute to the national economy after services sector which accounts 44.30% of the national economy. Hence, the study concluded that since agriculture sector has significant contribution to the Tanzanian economy, therefore, agriculture policy formulated and implemented by the Tanzanian government should focus much more on agriculture sub-sectors (crops, livestock, and fisheries) as the major contributors to the Tanzanian Gross Domestic Product (GDP) in general and Agriculture Gross Domestic Product (AgGDP) in particular.

**Key words:** Contribution, Agriculture sector, Agriculture Gross Domestic Product (AgGDP), and Tanzanian economy.

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## 1. Introduction

Agriculture is a science and practice of producing crops, livestock and fisheries from the natural resources of the earth (Encyclopaedia, 2013). However, agriculture sector is the mainstay of the Tanzanian economy which accounts 30 per cent of export earnings and employs 75 per cent of the labour force in the country (URT, 2009). Moreover, a couple of studies have estimated the contribution of agricultural sector to the nation economy in Asia, USA, Latin America and Sub Saharan African countries, including Tanzania. These studies include:

Joaquin (2010) estimated the contribution of agriculture sector to sustainable development in Jamaica; he argued that agriculture has been recognised as being important to reducing poverty and promoting rural development in Jamaica. Onjala (2010) calibrated impact of China-Africa trade relations in Kenya, he pointed out that agriculture is the dominant activity of Kenya's economy, with about 70 per cent of Kenyans living in rural areas and 75 per cent depending on agriculture for their livelihood. Alston *et al.*, (2010) estimated USA agricultural productivity growth and the benefit from public research and development spending, they found that the share of national income attributable to agriculture (including forestry and fisheries) held steady through to the end of the World War II, averaging about 9 per cent over the period 1929 – 1948, but since then it declined to around 0.8 per cent of national income during the period 2000 – 2007.

World Bank (2010) worked on food security and livestock development for poverty reduction in Latin America, Asia and Sub Saharan Africa, they revealed that although the agriculture sector makes a relatively small contribution to Gross National Income (GNI) or Gross Domestic Product (GDP), large proportions of national economically active labour forces are employed in agriculture. Anyanwu *et al.* (2010) estimated agriculture share of the gross domestic product and its implications for rural development in Nigeria using aggregate GDP model, they argued that agriculture is the largest non oil export earner and largest employer of labour force accounting for 88 per cent of the non oil foreign exchange earnings and 70 per cent of the active labour force of the population in Nigeria.

Mellor and Dorosh (2010) conducted a study on agriculture and the economic transformation of Ethiopia using GDP growth multiplier model, they argued that agriculture contributes 43 per cent to national income and employs 50 per cent of the labour force in

Ethiopia. Chanyalew *et al.* (2010) studied on Ethiopia's Agriculture Sector Policy and Investment Framework, Ten Year Road Map (2010-2020); they argued that the agricultural sector greatly influences economic performance in Ethiopia. Xinshen *et al.*, (2010) worked on economic importance of agriculture for sustainable development and poverty reduction in Ethiopia using Economy-wide Multimarket Model (EMM), and Semi-Input-Output (SIO) model; they revealed that with 85% of the population living in the rural areas depend on agriculture for their livelihood.

De Janvry and Sadoulet (2010) estimated agricultural growth and poverty reduction in Vietnam; they found that GDP growth originating in agriculture induces income growth among the 40 percent poorest, which is on the order of three times larger than growth originating in the rest of the economy. URT (2009) studied on accelerating pro-poor growth in the context of Kilimo Kwanza in Tanzania, they argued that agriculture sector contributes 95 per cent of the food consumed in the country while the required level for food self sufficiency is 120 per cent. Furthermore, the sector contributes 26.7 per cent of the Country's GDP; 30 per cent of total exports; and 65 per cent of raw materials for Tanzanian industries. It provides employment opportunities to about 75 per cent of Tanzanians. MAFSC (2009) studied on investment potential and opportunities in agriculture, crop sub-sector in Tanzania, they pointed out that agriculture is the mainstay of the Tanzanian economy; it contributes about 26.5 per cent of GDP and 30 per cent of export earnings.

MAAIF (2009) worked on what does a CAADP Compact offers Uganda, they reported that agricultural production made up 50 percent of total GDP (monetary and non-monetary) in the early 1990s. Agriculture is the source of employment for 70 per cent of the labour force in Uganda. OECD (2006) worked on promoting pro-poor growth agriculture in developing countries; they reported that in most poor countries; agriculture is a major employer and source of national income and export earnings. Shaban (2005) studied on regional structure, growth and convergence of income in Maharashtra, he reported that about two-third of the Maharashtra state population depends on agriculture, sector, yet the sector account for about 1/6th of the National State Domestic Product (NSDP).

**2. Materials and Methods**

**2.1 Types of Data**

This paper used time series data obtained from annual economic surveys conducted by the National Bureau of Statistics (NBS) in collaboration with the Ministry of Finance and Economic Affairs as well as Ministry of Agriculture and Food Security in Tanzania Mainland from 1981 to 2010, with the aim of examining the contribution of agriculture sector to the national economy. The time series data collected were Agriculture Gross Domestic Product from crops, livestock and fisheries subsectors, respectively.

**2.2 Model specification**

The contribution of agriculture sector to Tanzanian economy examined in terms of Agriculture Gross Domestic Product (AgGDP) contributed to the national income for thirty years period (1981-2010). The AgGDP was measured by using descriptive statistics as a mean market value of all agricultural products sold at the market per year. The Mean Model can be expressed as shown in equation one (1) below:

$$\bar{y} = \frac{\sum_{i=1}^n x_i}{n} \dots\dots\dots(1)$$

- Where:  $\bar{y}$  = Mean of AgGDP
- $x_i$  = AgGDP
- $\Sigma$  = Sigma indicates summation symbol
- n = Number of observation

The contribution of agriculture GDP to the national output was tested by employing t-test using the regression model as shown in equation two (2) below.

$$Y_t = \beta_0 + \beta_1 X_{1t} + \mu_t \dots\dots\dots(2)$$

Where:  $Y_t$  = National output at time 't' (TZS),  $X_{1t}$  = AgGDP at time 't' (TZS),  $\beta_0$  and  $\beta_1$  = Parameter estimates.  $\mu_t$  = Error term

The significant contribution of crops, livestock and fisheries subsectors to the AgGDP was determined by a Multiple Regression Model as expressed in equation three (3) below:-

$$Q_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \mu_t \dots\dots\dots(3)$$

Where:  $Q_t$  = Quantity of AgGDP at time 't' (TZS)

$X_{it}$  = Gross output of crops, livestock and fisheries subsectors at time 't' (TZS)

$\beta_i$  = Parameters

$\mu_t$  = Error term

### 3. Empirical Results and Discussion

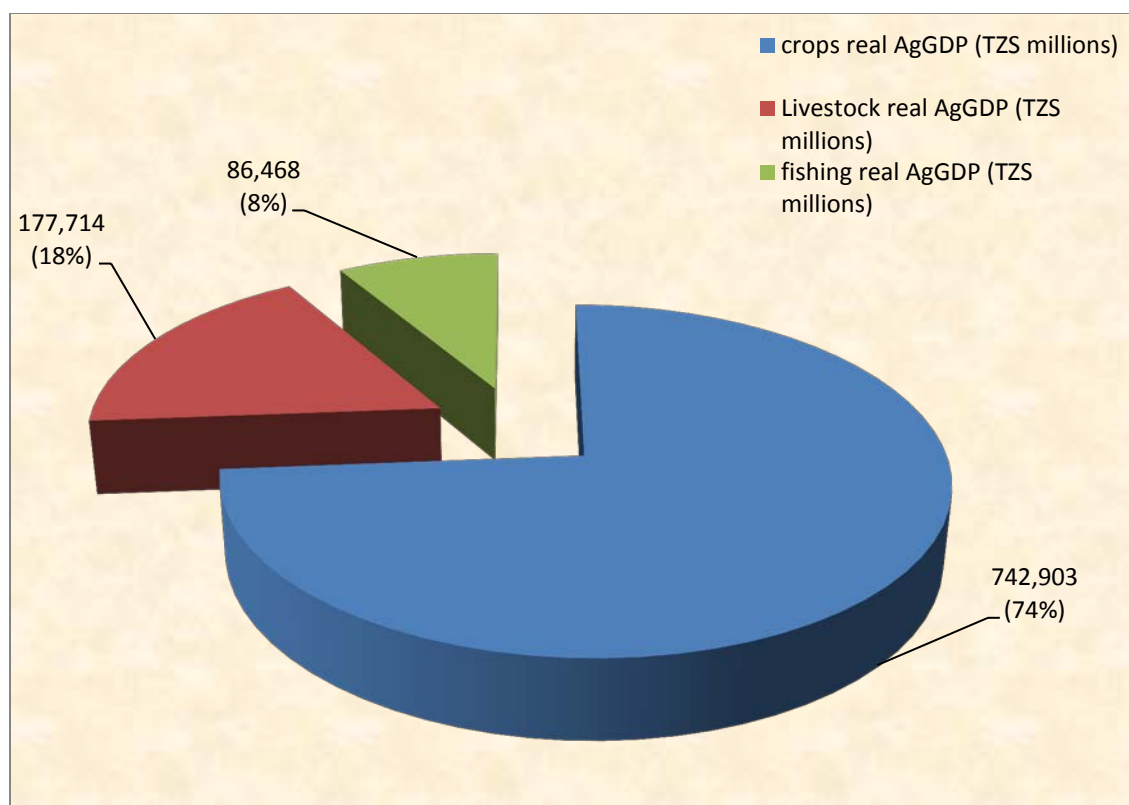
The contribution of agriculture sector to Tanzanian economy accounted for in terms of real Agriculture Gross Domestic Product (AgGDP). The contributions of agriculture sector to national output computed by employing descriptive statistics such as averages, percentages, charts and line graph for thirty years period.

#### 3.1 Average of real AgGDP

The real AgGDP computed by deflating the nominal AgGDP using GDP deflator. The average of real AgGDP computed for thirty years period with reference to prices of 1992 (1992 =100). The real AgGDP contributed by three subsectors of the economy namely: - crops, livestock and fisheries. The results revealed that crops subsector contributed 742,903 (74%) Tanzanian Shilling (TZS) millions, livestock subsector contributed 177,714 (18%) TZS millions and fisheries subsector contributed 86,468 (8%) TZS millions to the Agricultural Gross Domestic Product (AgGDP) (Table 1 and Figures 1, and 2).

**Table 1. Tanzania Mainland: Annual Average share of agriculture subsectors to real AgGDP from 1981 – 2010 at 1992 constant prices (Millions, TZS).**

Subsectors	Agriculture subsectors			Total
	Crops	Livestock	Fisheries	
Average	742,903 (74%)	177,714 (18%)	86,468 (8%)	1,007,084 (100%)



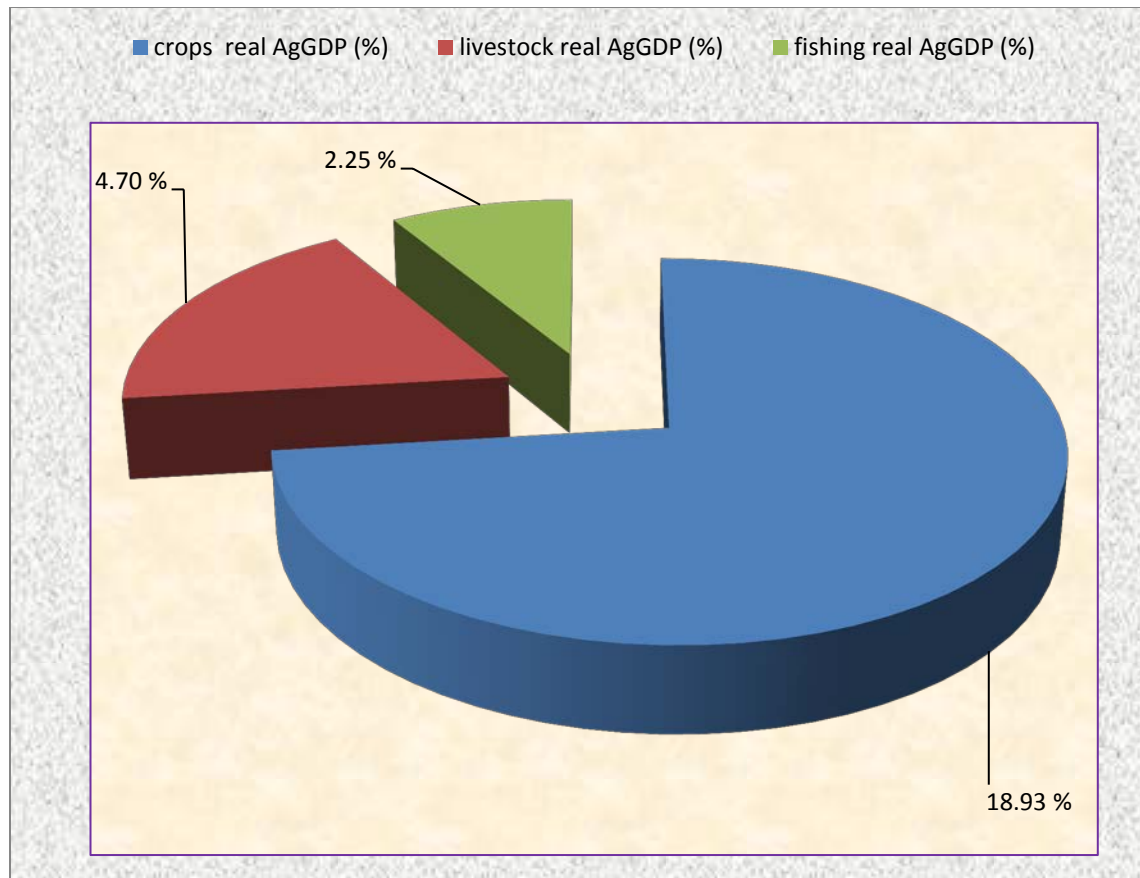
**Figure 1. Tanzania Mainland: Annual Average share of agriculture subsectors to real AgGDP from 1981 – 2010 at 1992 constant prices (Millions, TZS).**

### 3.2 Percentage share of real AgGDP to real national output (GDP)

The results show that percentage share of real AgGDP to national real GDP is 25.88%, contributed by crops subsector (18.93%); livestock subsector (4.70%) and fisheries subsector (2.25%) (Table 2 and Figure 2).

**Table 2. Tanzania Mainland: Share of real AgGDP subsectors to national output (GDP) from 1981 – 2010 at 1992 constant prices (Millions, TZS).**

Subsectors	Agriculture subsectors			Total
	Crops	Livestock	Fisheries	
Percentage	18.93	4.70	2.25	25.88

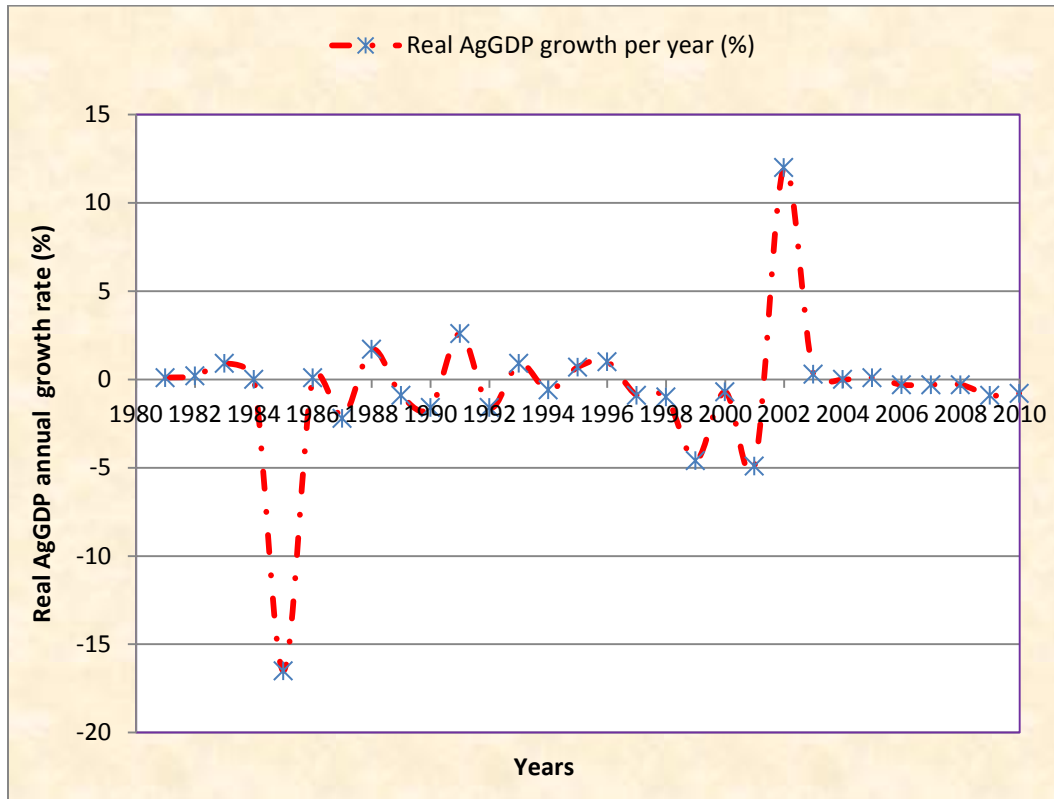


**Figure 2. Tanzania Mainland: Share of real AgGDP by subsectors to national real output (GDP) from 1981 to 2010 at 1992 constant prices.**

### 3.3 Trend of Agriculture Gross Domestic Product (AgGDP)

The trend of growth of real AgGDP has undergone several depression and boom periods (Figure 3) due to price fluctuations of agriculture commodities in the domestic and world markets. The depression of the real AgGDP in 1985 was influenced by recession in prices of the tradable crops in the world market which discouraged farmers to grow traditional crops (cotton, coffee, sisal and tea). On the other hand the depression of real AgGDP in 1985's attributed by withdrawal of subsidies provided by the government to farmers due to trade liberalization. Therefore, business of agri-inputs such as fertilizers was left to private firms operating in the market. This led farmers to abandon the production of traditional crops due to high cost of production as well as low market price of their produce. In the 2002 there was a boom in AgGDP due to diversification of the agricultural economic activities whereby farmers switched to

production of high value crops (fruits, vegetables, flowers and spices) influenced by high consumer demand in the domestic and global markets (Figure 3).

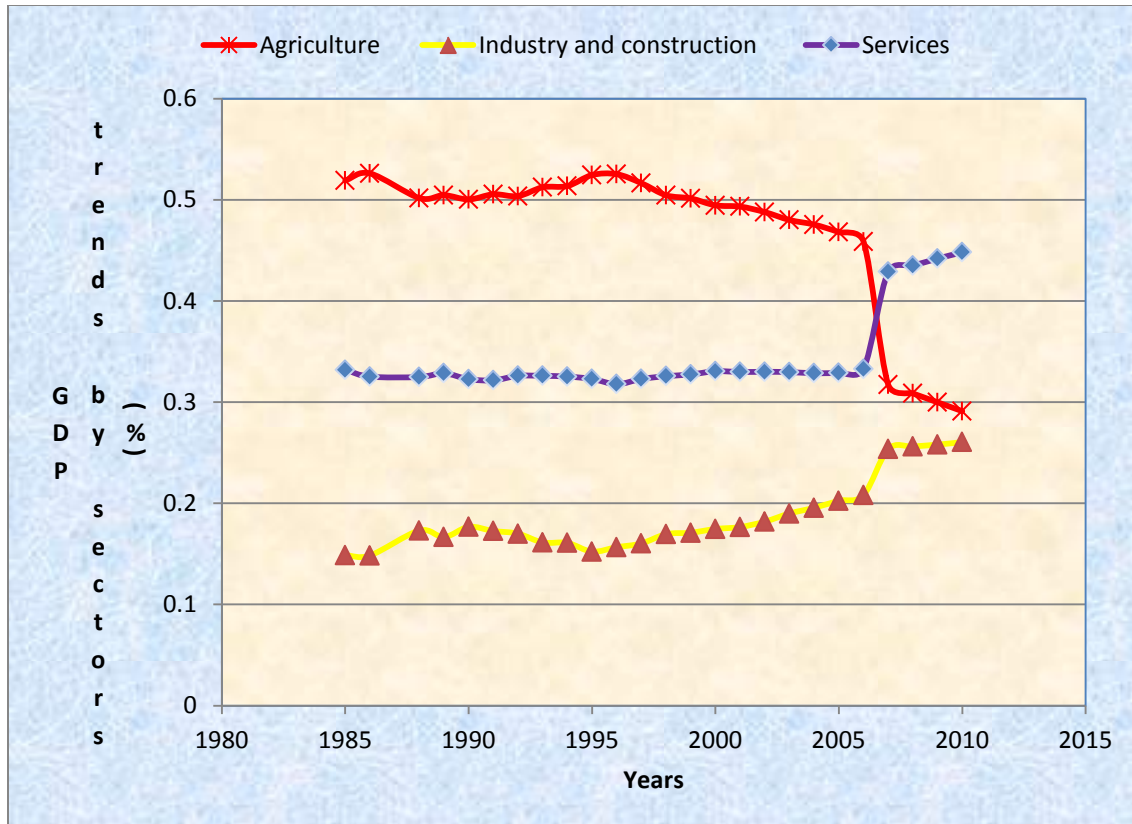


**Figure 3. Tanzania Mainland: Trend of annual growth rate of real AgGDP from 1981 – 2010 at 1992 constant prices (%).**

### 3.4 Comparison of GDP by sectors of the economy

The agriculture GDP in the 1980's and 1990's was hiking due to the fact that agriculture was the main economic activity in the country. However, in the 2000's Agriculture GDP started to shrink because the economy was diversified into other sectors of the economy such as industry, construction and services due to market failure of the of the foreign trade of agriculture products such as coffee, tea, and cotton as were the main traditional crops for exports from Tanzania to the rest of the world. Furthermore, in the 2000's the other sectors of the economy such as services started to grow fast due to high consumer demand of services sectors such as tourism, communication and transportation in the country and abroad (Figure 4).





**Figure 4: Tanzania Mainland: Trends of GDP growth by economic sectors from 1980 - 2010 at 1992 constant prices.**

**3.5 Hypothesis testing**

The following null and alternative hypotheses were tested by the study.

**H<sub>0</sub>:** The Agriculture sector has no significant contribution to Tanzanian economy.

**H<sub>1</sub>:** The Agriculture sector has significant contribution to Tanzanian economy.

The contribution of agriculture GDP to the national output (GDP was tested by employing t-test using the regression model as shown in equation four (4) below.

$$Y_t = \beta_0 + \beta_1 X_{1t} + \mu_t \dots \dots \dots (4)$$

Where:  $Y_t$  = National output (GDP) at time 't', (TZS),  $X_{1t}$  = AgGDP at time 't' (TZS),  $\beta_0$  and  $\beta_1$  = Parameter estimates,  $\mu_t$  = Error term.

**Table 3. Analysis of variance of contribution of agriculture sector to the Tanzanian economy**

Source	DF	Sum of Squares	Mean Square	F-value	P-value
Model	1	2.382632E15	2.382632E15	1859.51*	<.0001
Error	28	3.587698E13	1.281321E12		
Corrected	29	2.418509E15			
Total					

Note: \* implies F-value is significant at  $P < 0.0001$  which is  $< 0.05$  (5%) level.

**Table 4. Model summary of contribution of agriculture sector to the Tanzanian economy**

Root MSE	1131954	R-Square	0.99
Dependent Mean	6584718	Adj R-Sq	0.98
Coeff Var	17.19063		

**Table 5. Parameter Estimates of contribution of agriculture sector to the Tanzania economy**

Variable	DF	Parameter Estimates	Standard Error	t-value	P-value
Intercept	1	-259864	260585	-1.00	0.3272
AgGDP	1	4.29823	0.09968	43.12*	<.0001

Note: \* implies t-value is significant at  $P < 0.0001$  which is  $< 0.05$  (5%) level.

The AgGDP has significant contribution to the national output due to the fact that 98% of proportional of variation in national output is explained by proportional of variation in AgGDP under *ceteris paribus* assumption. If the AgGDP increases by 1 TZS, the national output is expected to increase by 4 TZS and 30 cents under *ceteris paribus* assumption. If AgGDP is minimum the national output would decrease by 259,864 TZS millions. However, the AgGDP has statistically significant contribution to national output (GDP) at t-value of 43.12 with  $Pr < 0.0001$ ; hence rejects the null hypothesis and concludes that agriculture sector has significant contribution to Tanzanian economy at 5% level of significance.

### 3.6 Significant contribution of crops, livestock and fisheries subsectors to the AgGDP

The t-statistic test was employed to carry out the hypotheses test stated above.

The Ordinary Least Squares (OLS) was employed to estimate the regression model expressed in equation five (5) below.

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \mu_t \dots\dots\dots(5)$$

Where:

$Y_t$  = Aggregate real agricultural gross domestic product at time ‘t’ (TZS)

$X_{it}$  = crops, livestock and fishing real GDP at time ‘t’ (TZS)

$\beta_0$  = Parameter estimate of aggregate real AgGDP

$\beta_1$  = Parameter estimate of crops real GDP

$\beta_2$  = Parameter estimate of livestock real GDP

$\beta_3$  = Parameter estimate of fisheries real GDP

$\mu_t$  = Error term

After running the Ordinary Least Squares (OLS) regression model the following empirical results were obtained.

**Table 6. OLS model summary of real AgGDP**

R-Square	Adj R-Square	Standard error	Observations
0.99	0.98	389.23	30

**Table 7. OLS Parameter estimates of real AgGDP**

Variables	Parameters	Coefficients	Std error	t-statistic	P-value
Intercept	$\beta_0$	127.47	110.2564	1.1561	0.258
Crops	$\beta_1$	0.97	0.000161	6199.149*	< 0.0001
Livestock	$\beta_2$	0.95	0.002445	409.0011*	< 0.0001
Fishing	$\beta_3$	0.87	0.004974	200.7828*	< 0.0001

Note: \* implies t-values are significant at  $P < 0.0001$  which is  $< 0.05$  (5%) level.

The empirical results show that 98% of proportional of variation in the real AgGDP is explained by proportional of variation in crops, livestock and fisheries subsectors under *ceteris paribus* assumption (Table 5.123). If crops subsector rose by 1 percent the real AgGDP is expected to rise by 97 % under *ceteris paribus*. If livestock subsector rose by 1 percent, the real AgGDP would rise by 95% under *ceteris paribus* and if fisheries subsector rose by 1 percent, the

real AgGDP would rise by 87% under *ceteris paribus* assumption (Table 7). However, crops, livestock and fisheries subsectors contributed significantly well to the aggregate real agricultural gross domestic product (AgGDP) at t-statistics of 6199.149, 409.0011 and 200.7828 which are statistically significant at  $Pr < 0.0001$ , respectively (Table 7). Hence, the results obtained led to rejection of the null hypothesis and concludes that agriculture sector has significant contribution to Tanzanian economy at 5% level of significance.

Similar findings have been reported on contribution of the agriculture sector to the national economy, by Anyanwu *et al.* (2010), Chanyalew *et al.* (2010), Joaquin (2010), Shaban, (2005), OECD (2006), Onjala (2010), URT (2009), MAFSC (2009), MAAIF (2009), World Bank (2010) and Xinshen *et al.* (2010), they concluded that agriculture sector has significant contribution to the global economy in general and rural based economy in particular.

#### **4. Conclusion and policy implications**

According to the empirical findings of the study; it is concluded that even though agriculture sector contributes much more to the national economy but Agricultural Gross Domestic Product (AgGDP) is falling due to low incentives provided by the Tanzanian government caused by shifting of the resources to other sectors of the economy such as services, mining, industry and construction. Hence, agriculture policy formulated and implemented by the Tanzanian government should focus much more on agriculture sub-sectors (crops, livestock, and fisheries) as the major contributors to the Gross Domestic Product (GDP) in general and Agriculture Gross Domestic Product (AgGDP) in particular. However, agriculture sector has trickledown effect to the development of rural poor farmers in the country; hence, improvement of the agriculture sector as the major employer of labour force implies alleviation of poverty in the country.

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#### **Competing interest**

Author has declared that no competing interests exist.

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