ROLE OF AGRICULTURE IN ECONOMIC DEVELOPMENT OF DEVELOPING COUNTRIES: CASE STUDY OF CHINA AND SUB-SAHARAN AFRICA (SSA)

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Abstract

This paper analyzed the influence of agriculture in GDP of China and three SSA countries. Data used for the study was drawn from the Food and Agriculture Organization for SSA countries and the statistical offices reported in China statistical yearbook. The study covered the period 1990-2001. Ordinary least square multiple regression was used to analyze the data. The resulting conclusion was that in China as well in Cameroon, Congo and Burkina-Faso agriculture has an effect on GDP. Only while this effect is positive for China, Congo and Burkina Faso, in Cameroon was negative. This negative effect can be explained by the vigorous recovery of the general economic situation, which led to a total reduction of the agriculture place in economy of the country.

Keys words: agriculture, economic development, developing countries

INTRODUCTION

Agriculture is an important sector for sustaining growth and reducing poverty in developing countries. Because the food and agriculture sector dominates most developing countries economies in terms of contribution to GDP, employment and incomes, its growth and development are essential for the overall process of socioeconomic development of developing countries.

In the majority of the developing countries, the agricultural sector occupies a place of choice in the strategies and the development models; it represents a large part of gross domestic product (GDP) (from 30% to 60% in two thirds of them approximately, FAO 2001). The role of

Agriculture is to provide adequate output to assure global food security and enhance their economic development prospects. With a majority of the world's population living in rural areas in developing countries, agriculture remains a key economic activity to provide people with the capacity to feed themselves by producing their own food or as a source of employment and income to access food supplies.

Throughout history, advances in agricultural technology are linked directly to improvements in agriculture, in health, and the development of vigorous economies. Only, realities not being the same in all these developing countries one wonders whether the role played by agriculture in various developing countries is applicable to other countries take into account their weaknesses of agricultural sector, do not enjoy the benefit of the agriculture favorable for development of the country, and why a such reality?

Even though China and SSA are both developing countries, fast economic growth in China calls for the attention of all countries around the world. For many SSA, China is still considered almost as a "strange" country and least to mention the agricultural sector where there is no or very little knowledge about the opportunities that China can offer.

In China, for example the annual growth rate of GDP passed from 8.5 percent in 1979–84 to 9.7 percent in 1985–95 and continued growing at 8.2 percent annually between 1996 and 2000. Foreign trade has expanded even more rapidly. The ratio of trade to GDP increased from 13 percent in 1980 to 44 percent in 2000; but in SSA economic growth stood at 3 percent in 2000, Agriculture provides only 2% of their GDP, compared with 10% in middle-income and 41% in low-income countries (World Bank, 2000).

Many economists have discussed the role of agriculture in economic development. Johnston and Mellor (1961) identified what is today considered the fundamental role of agriculture to economic development. The economists focused on how agriculture could best contribute to overall growth and modernization. In these same years Johnston and Mellor's classic article, in which they identify five types of inter-sectoral

Table 1: Percentage changes in the structure of China's Economy, 1970-98

	1970	1980	1985	1990	1995	1998
Share in GDP						
Agriculture	40	30	28	27	20	18
Industry	46	49	43	42	49	49
Services	13	21	29	31	31	33
Share in Agric. Output						
Farming (crop)	82	76	69	65	58	56
Forestry	2	2	4	5	8	10
Livestock	14	18	22	26	30	31
Fishery	2	2	4	5	8	10
Share in employment	81	69	62	60	52	40
Agriculture	10	18	21	21	23	23
Industry	9	13	17	19	25	27
Services						
Share in export						
Primary products	na	50	51	26	14	11
Foods	na	17	14	11	7	6
Share in Imports						
Primary products	na	35	13	19	18	16
Foods	na	15	4	6	5	3
Share of rural population	83	81	76	72	71	70

Source: State Statistical Bureau, China Statistical Yearbook, various issues; and China Rural Statistical Yearbook, various issues.

Generally, the importance of China's agriculture is seen in the challenge of meeting the demand for food of about 20% of the world's

population using only 9% of the world's cultivated area. In 2000, agriculture contributed 15.9 percent of the country's total GDP, and 50 percent of the country's employed people were engaged in agriculture. In 2001, the rural population was 795.63 million, accounting for 62.3 percent of the national total (NBS, 2003).

In SSA, their agriculture above the end several decades present a relatively disappointing history for the economic development of the region. It was the disastrous failure of the agriculture strategy, agriculture is primarily rain fed and operated by small-scale farmers and contributes 20% of the value of total merchandise exports (down from over 50% in the 1960s). The importance of agriculture to the national economies in SSA and as a source of employment emerged from the data provided in the sectoral reports, as shown in Table 2.

Table 2: Importance of Agriculture to the National Economies in SubSaharan Africa.

Country	Contribution of Agriculture to GDP	Population employed/involved in agriculture (percent)
Benin	**40**	**70**
Burkina Faso	**45**	**-85**
Congo	**8**	**52**
Mauritania	**22**	**n.a**
Morocco	**15-20**	**40**
Namibia	**11**	**79**
Sudan	**40**	**80**
Tanzania	**50**	**85**
Zimbabwe	**11**	**71**

The definition of the population employed/involved in agriculture varied among the reports. While some countries cited official national figures of the economically active population, which in some cases

excluded subsistence farmers, others gave estimates of the proportion 'involved' or 'dependent upon' agriculture which may include subsistence farmers. UNDP, 1994

The agricultural sector contributes from a low of 8% of GDP in the Congo to a high of 45 % Burkina Faso and more than other SSA countries. In other countries such as the Congo, Namibia and Zimbabwe, where the contribution of the agricultural sector to GDP is small, the sector still plays an extremely important role as a source of employment. In the early 1990s countries in the West and Central African franc zones faced serious economic difficulties, the agricultural sector was not spared from this general trend, with continuous declines in the value of agricultural exports and production per capita registered from the mid-1980s to the early 1990s. Slow growth in agricultural productivity, which lagged behind population growth, contributed to uncertainty regarding to food security and general economic development.

Figure1 shows the share of agriculture in GDP for developing countries from 1990 to 2001. As the figure shows agriculture share of GDP in 1990 was 27% for China, 12.3% for Congo and since then, it has decreased to 16.3 % for China and 7.2 % for Congo in 2000 i.e. agriculture tends to decline more quickly as a percentage of GDP, rapid growth in industrial and service sector production in these countries causes agriculture's share of GDP to decline early in the growth process, but it takes longer for many people in rural areas to respond to this by making the move to urban areas. Taken into account for the same period, the share of agriculture in GDP increasing from 24.2% in 1990 to 53.5 in 2000 for Cameroon and 28.4 % in 1990 to 38.7 % in 2000 for Burkina Faso

METHODOLOGY

This paper analyzed the influence of agriculture in GDP of developing countries using the multiple regression model to learn more about the relationship between agriculture, industry, service or predictor variables and GDP or criterion variable. The data used in this study came from various sources.

In SSA the data used were collected primarily from the statistical database of the Food and Agriculture Organization of the United Nations (FAOSTAT, 2001). Other important source was the national statistical services in Africa. Three countries of SSA were selected through random sampling: Cameroon, Congo and Burkina Faso (all French-speaking countries) for the purposes of our disaggregate analysis.

In China, documentary research was used in order to exploit various information from an analysis of available documentation of statistical offices reported in China statistical yearbook 2001 and China Agricultural Yearbook (various issues), from 1990-2001. Statistics Bureau in China is the main source of data for economic studies and this data cover almost all economies activities, including GDP, Agriculture, Industry and Service.

In order to develop this model, four different indicators were used to characterize the role of agriculture in economic development of developing countries: GDP, or *Gross Domestic Product* (Explained variable), is a measure of how big an economy is. *Nominal GDP* is expressed in current prices (in dollars). Production approach expresses GDP as the total value of final goods and services produced by all production units in a country within a certain period (usually in one year period).

Explanatory variables, Agriculture output *(Primary sector)* is defined as first transformation of natural resources; it includes the production of cultivable food products. Agriculture here includes crop and livestock production, Forestry, Hunting and fishing.

Industry *(Secondary sector)* is defined as the processing sectors of the primary goods into more elaborate products, until those produced for the final markets. Includes the value added in mining, manufacturing, construction, electricity, water, gas. Service *(Tertiary sector)* is defined as production of services, in opposition to goods; the services are produced and consumed directly, without storage and transformation of goods: services of cleaning, health. Include the value added in all others branches of economic activity.

The Choice of Econometric Model

Given the nature of the dependent variable, GDP, which is a discrete variable, to examine such relationships between a dependent variable and a set of independent variables, multiple regression analysis was utilized.

The regression equation takes the general form:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_n X_n + e \quad (1)$$

In our analysis the model equation is presented as follows:

$$GDP = \beta_0 + \beta_1 \text{ Agriculture} + \beta_2 \text{ Industry} + \beta_3 \text{ Service} + e \quad (2)$$

$$G = \beta_0 + \beta_1 A + \beta_2 I + \beta_3 S + e \quad (3)$$

We consider four economic aggregates: Gross Domestic Product (GDP), Agriculture, Industry and Service. This does not attach less importance to other indicator (Labor, Capital etc...) but these were chosen due to availability of relevant information on them. They are denoted as following: G is GDP; A is agriculture output; I is industry; S is service; b_0 is a constant or intercept; b_1, b_2 and b_3 are the estimated regression coefficients (share of agriculture, industry and service affected to GDP). The database being made up, calculations in multiple linear regression were realized by the econometric software Eviews.

RESULTS OF ANALYSIS

Using data for the period 1990-2001 the equation is estimated using OLS estimation procedure. The estimated results are reported below.

Table 3: results of regression analysis for China

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	20507.97	5307.939	3.863641	0.0048
AGRI	0.906913	0.143308	6.328413*	0.0002
INDU	1.716415	0.078618	21.83220*	0.0000
SERV	0.189752	0.040145	4.726713*	0.0015
R^2	0.999885	Mean dependent var	697601.5	
Adj R^2	0.999842	S.D. dependent var	331460.8	
S.E. of regression	4163.639	Akaike info criterion	16.92949	
Sum squared resid	1.39E+08	Schwarz criterion	17.09113	
Log likelihood	-114.6042	F-statistic	23234.85	
Durbin-Watson stat	1.120877	Prob (F-statistic)	0.000000	

Table 4: Results of regression analysis for Cameroon

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	18686.88	7989.014	2.339073	0.0475
AGRI	-1.124898	0.426149	-2.639684*	0.0297
INDU	3.506147	0.991340	3.536774*	0.0077
SERV	- 4.708331	3.374088	-1.395438	0.2004

R^2	0.764270	Mean dependent var	9634.385
Adj R^2	0.675871	S.D. dependent var	1624.516
S.E. of regression	924.8742	Akaike info criterion	13.92052
Sum squared resid	6843139.	Schwarz criterion	14.08215
Log likelihood	-96.55036	F-statistic	8.645714
Durbin-Watson stat	2.013030	Prob (F-statistic)	0.006843

Table 5: Results of regression analysis for Congo

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3682.339	1818.938	-2.024445	0.0775
AGRI	6.339573	2.066684	3.067510*	0.0154
INDU	2.202194	0.879421	2.504142*	0.0367
SERV	2.396651	1.622179	1.477427	0.1778
R^2		0.691109	Mean dependent var	2449.893
Adj R^2		0.575275	S.D. dependent var	452.7457
S.E. of regression		295.0586	Akaike info criterion	11.63555
Sum squared resid		696476.8	Schwarz criterion	11.79719
Log likelihood		-82.84056	F-statistic	5.966366
Durbin-Watson stat		2.387298	Prob (F-statistic)	0.019429

Table 6: Results of regression analysis for Burkina Faso

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	347.6267	832.4711	0.417584	0.6872
AGRI	6.831534	2.327205	2.935511*	0.0188
INDU	-1.136670	2.721974	-0.417590	0.6872
SERV	-3.045200	1.136584	-2.679256*	0.0280
R^2	0.558976		Mean dependent var	2340.482
$\overline{R}^2$	0.393591		S.D. dependent var	301.5647
S.E. of regression	234.8352		Akaike info criterion	11.17897
Sum squared resid	441180.6		Schwarz criterion	11.34061
Log likelihood	-80.10108		F-statistic	3.379861
Durbin-Watson stat	2.058499		Prob (F-statistic)	0.074786

t-statistics

* Significant at 5% level

From the tables of estimates, in the case of China (Table 5), R^2= 0.999885 shows that GDP depends heavily on agriculture, industry and services i.e. 99% dependence This value measures the strength of the relationship between the independent variables and the dependent variable. Even for adjusted R^2 ($\overline{R}^2$) the relation is 99%. This shows the statistical dependence of GDP on agriculture, industry and services. The test statistic for this test is reported in the regression output as F = 23234.85.

Since 23234.85 > Calculated F value of 4.07, we reject the null hypothesis and state that at least one of the β is not equal to zero. There is a

significant relationship between the dependent variable and our three independent variables.

We can now look at the significance of each individual independent variable using a t test.

We use α = 0.05 and n - k - 1 = 8 we have the following decision rule. Since all the t statistic are superior to 2.306: 6.328; 21.832; 4.726 respectively for agricultural, industry and services, we reject the null hypothesis and conclude that agriculture as well as industry and services contribute positively to GDP, which implies that the agricultural sector affect positively or has a positive impact on the GDP.

In the case of Cameroon, R^2 = 0.764270, adjusted R^2 =0.675871, F= 8.645714; F>4.07. This means that the regression is globally significant. The t test of agricultural -2.639684 and for industry 3.536774 are both significant but agricultural coefficient has a negative sign, which implies that the agricultural sector has a negative effect on GDP. Besides, service test statistic is -1.395438, and did not exceed the critical value of tα (2.306) and is insignificant.

In case of Congo, R^2 = 0.691109, Adjusted R^2 = 0.575275. F=5.966366; F>4.07. The regression is generally significant. T test for agriculture is 3.067510 and 2.504142 for industry. They exceeded the critical value of 2.306, we therefore reject the null hypothesis and keep the alternative which testifies the significant of the regression coefficient. Agriculture and industry have a significant positive influence on GDP while the services sector is not significant, and the value of t test is 1.477427.

The model for Congo and Cameroon have some similarities about their results: services sectors are not significant. The t values for Agriculture and industry were significant. The effect of agriculture was negative in the case of Cameroon while it was positive in the case of Congo.

In the case of Burkina Faso, R^2=0.558976, Adjusted R^2= 0.393591.F=3.379861; F<4.07. Generally, the regression was not significant. The test statistic of agriculture was 2.935511 and service was -

2.679256 both exceed the critical value of tα (2.30) then both were significant but the effect of service is negative. The t value for Industry was -0.417590 which was not significant i.e. industry did not have a significant influence on GDP.

In summary the analysis shows that in China as well as in Cameroon, Congo and Burkina faso, agriculture has an effect on GDP. Only while this effect is positive for China, Congo and Burkina -faso, in camerron is negative. The agricultural sector is the single largest contributor to income and employment generation and a vital element in the country's challenge to achieve self-sufficiency in food production, reduce rural poverty and foster sustainable economic development. Agriculture is the backbone of production; the dynamo of economic development. It has a significant effect on overall employment, income, export revenue and then on GDP (Poonyth, 2001).

But the degree of correlation between agriculture and GDP varies from country to country which has achieved different level of economic developement. This degree of correlation is higher in China than in SSA. The Chinese government has always been considering agriculture as the basis of the national economy and made tremendous efforts to increase its agricultural output though economic reforms, increasing government capital investment in the agricultural sector, increasing inputs in production, adapting new technology and introducing improved seed varieties. Chinese leaders of three generations have, on various occasions, consistently emphasized the importance of agriculture, and paid tremendously attention to the growth of agricultural production. This is confirmed by the regression results.

In the SSA, although agriculture influence is significant, agricultural sector is not really reinforced by the government. The common factor between these countries is that they did not pursue good agricultural and rural development policies.

CONCLUSION

The influence of agriculture on the GDP of developing countries using the multiple regression model was investigated. The results showed very interesting insight as to the extent of the importance of agriculture in the China and SSA economies. Agriculture remains the cornerstone of China and SSA economies. In both China and SSA, agriculture has a significant effect on GDP. However, the relationship was negative in the case of Cameroon. This negative relationship can be explained by the vigorous recovery of the general economic situation, which led to a total reduction of the place of agriculture in the economy of the country. Agriculture which represented 57 % of the GDP in 1971-73 decreased to 30 % in 1981-83; 24 % in 1988-90 then to 54% in 2001.

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Figure1: share of agriculture in GDP for each country