Institutional Differences and Agricultural Performance in Sub-Saharan Africa

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Abstract

Countries successful in achieving growth and equity throughout their development process could provide continuing gross flow of resources to agriculture in the form of technical, educational, and financial elements combined with proper institutions and policies to increase agricultural productivity. The main purpose of this study is to analyze the impact of institutional differences in governance, markets and health on the overall agricultural performance of Sub-Saharan Africa countries. Government spending, corruption control, and lower mortality rates at birth imply better governance and health situations in the countries and have significant positive impact on the value added by agriculture to the GDP of those countries.

Keywords: agricultural performance, institutions, Sub-Saharan Africa, growth

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Agriculture's contribution to economic and social development can be examined at two different levels. First, agriculture's function of providing agricultural surplus to other sections in the economy and second its contribution to output, income and employment of the whole economy. The contribution of agricultural output and productivity increase to overall economic growth can take place in five different ways: (1) expansion of food supplies matching the growth of demand generated by economic development; (2) increase in exchange rate earnings via expansion of exports of agricultural commodities; (3) providing labor force for manufacturing and other growing sectors of the economy; (4) contribution to capital accumulation required for the expansion of the industry; and (5) increase in net cash income of the farms. Countries successful in achieving growth and equity throughout their development process could provide continuing gross flow of resources to agriculture in the form of technical, educational, and financial elements combined with proper institutions and policies to increase agricultural productivity (Johnston and Mellor 1961; Thorbecke and Morrisson 1989).

Institutions help translate the potential for capital accumulation and savings from increased agricultural productivity into actual increase in investment. Political and institutional problems make this process more difficult. In many developing countries, lack of certain technical, educational and institutional inputs, known as complementary inputs, causes low productivity of conventional inputs like labor, land and other resources in agricultural sector. Identifying these complementary inputs and determining the required combination of them would greatly help to prioritize development programs designed to increase their availability (Johnston and Mellor 1961). The institutional factors can be categorized as political, economic and health variables. The main purpose of this study is to analyze the impact of institutional

differences in governance, markets and health on the overall agricultural performance of developing countries. To do so, we use internationally reported indices of governance, economic and health status in Sub-Saharan Africa (SSA) countries for the time period of 1995-2011 which will be explained more in the next section.

Sub-Saharan Africa (SSA) consists of 48 countries and one territory. Historically referred to as "Black Africa" it is distinct from North of Africa which consists of Arab Muslim countries. Institutional and political problems such as ethnic conflicts, political corruption, military governments and secessionist movements caused the large lag in the development process of the region (Tyler and Gopal 2010). In contrast to Asia and Latin America, decision makers in SSA continue to struggle to find solutions to obtain rapid growth and to define the role of agriculture. This continuous debate is not only about the general role of agriculture in economic development but also about policy priorities in these countries such as export crops versus food crops, large versus small farms, mechanical versus biological technology, and so forth (Delgado, Mellor and Blackie 1987).

Based on Johnston and Mellor (1961) agricultural development occurs in three phases. The first phase is the development of agricultural preconditions in which there is some perceived personal gain by farmers. The most critical requirement for this phase would be improvements in land property rights. The second is increase in agricultural output using labor intensive, capital-saving techniques. Then the third phase is expansion of agricultural output based on capital intensive, labor-saving technology. It seems that the majority of the SSA countries are still at the first or optimistically the second phase.

Statistical facts show that Sub-Saharan countries could not foster agriculture production, as much as expected, in spite of the efforts and policy recommendations made by a broad range of national and international organizations. This slow growth in agricultural production might be one of the main reasons that development indices in SSA are still poor. Average years of education in most of the developing countries including SSA for rural adult males are 4 and for rural adult female are 1.5 to 4 years. Only half of the rural population in SSA has access to improved water and sanitation. Poor health reduces productivity (World Bank 2007).

Government plays an important role in each and every aspect of economics and politics in developing countries. Agriculture-based countries tend to suffer more from governance problems because they are more likely to be in the early stages of development and thus other industrial sectors and attendant institutions like liberal markets and private investments are not formed completely yet. The presence of government in all aspects of decision making from production stage to the market regulations would hurt overall growth because it is more likely to face market failure in this situation. Governance infrastructure is crucial to create and maintain institutions required for functioning of the market system and to improve incentives for production and investment. Good governance lowers the transaction costs, creates and supports competitive environment, and encourages agricultural innovation (Lio and Liu 2008). For a long time most of the international assistance programs have focused on providing irrigation facilities and chemical fertilizers, introducing modern agricultural technologies, and building schools to stimulate agricultural performance in developing countries. Studies on least developing countries however show that agricultural productivity declines even in countries that adopted green revolution varieties of rice and wheat. The absence of good governance severely limits the achievements of development (Lio and Liu 2008; Fulginiti and Perrin 1998). Government

problems are mentioned as the main reason of failure in implementation of recommendations in the 1982 World Development Report on agriculture. Today there is a higher probability to overcome governance problems than in 1982 due to institutional improvements and ongoing processes of corruption control, public sector management reform, decentralization efforts, raising weight of agribusiness, civil society participation, and democratization during these years which optimistically would provide a great potential of improving agricultural performance (World Bank 2007).

This study fits in the political economy literature that focuses on how politics and economics are interrelated. There are at least three features that must be included in a model of politics and growth. First, it should reveal a political conflict in the society to capture some heterogeneity among agents. Second, it should specify political institutions which help to form actual policies. Finally, it should explain the underlying economic structure (Verdier 1994). Institutions in this study are categorized into three broad areas of political, economic and health institutions. We emphasize political institutions and government role in this study. Political systems and rights as well as political stability are main indicators of governance status considered in the literature studying impact of political institutions on agriculture productivity and growth. Farmers need to make economically sound decisions to develop agriculture. One alternative is using specialized management, like collective farms, to train the mass of farmers. Because of the nature of agriculture this is not possible without significant duplication of effort. Another alternative is using more decentralized management and on-the-spot supervisory decisions which increase the individual interest in the farm outcome and have positive impact on incentives (Johnston and Mellor 1961). Empirical studies show that agricultural assistance "peaks" with dominant party systems and then becomes non-increasing with further

democratization and rents to be dissipated in the most democratic systems (Beghin and Kherallah 1994). SSA countries with political conflicts and wars experienced a significant reduction in agricultural productivity while higher levels of political rights and civil liberties lead to higher productivity levels (Fulginiti, Perrin and Yu 2004; Tyler and Gopal 2010). Political instability and government size are factors that have significant negative impact on the overall economic growth in emerging economies. The negative effects of government size in non-democratic socialist systems are three times as great as in countries with democratic market systems (Guseh 1997; Fosu 2001).

The objective of this paper is not the approval or disapproval of a specific political-economic system. For a long time now state-controlled markets have been considered inefficient in allocation of resources, however, gradually it has also become clear that private markets may experience inefficiencies too. Considering the level of economic freedom and/or level of trade freedom in this study reflects the degree of market liberalization and presence of private sector in agricultural markets. Higher engagement in the commercial agricultural markets as the key feature of agricultural development is considered as both cause and consequence of productivity growth and higher standards of living among rural households.

To the best of our knowledge, the literature on political economy of growth mostly examined the impact of various institutional variables on the overall economic growth but a few studies focused on the impact of various institutions on the agricultural sector outcome especially in SSA countries. The contribution of this paper is to analyze the impact of political, economic and health indicators as main institutional variables, on the outcome of the agricultural sector in selected SSA countries.

Methods and Data

The interrelation between agricultural and industrial development in a country shows the importance of the agricultural sector, as the primary and dominant sector in most developing countries. Thus, the development of the agricultural sector and the factors that affect it are highly critical in early stages of the growth process. Institutional factors can provide the basic infrastructure required for capital accumulation and investment needed in developing countries. The focus of this paper is to assess the impact of institutional variables on the outcome of the agricultural sector in SSA countries. Institutions are represented by the governance, health and economic indices reported by national or international organizations.

Various types of indices have been used in the literature. Beghin and Kherallah (1994) included political system dummies, index of civil liberties, tax constraint variable, and measures of development such as share of agriculture in GDP, terms of trade, and comparative advantage in agriculture. Fulginiti, Perrin and Yu (2004) used Colonial heritage dummies, number of years of independence, armed conflicts dummies and political rights or civil liberty dummies as institutional variables. Tyler and Gopal (2010) included Governance Indicators such as political stability and absence of violence and government effectiveness, export and import value as percent of *GDP*, Human Development Index, health indicator, technology indicator, Food Production Index. Fosu (2001) used events of coups d'état as the measure of political instability in a simple Cobb-Douglas production function. He assumed that the parameters are functions of political instability and specified the model as a linear regression of output growth on political instability, growth rate of labor and capital as well as their interaction with political instability. Guseh (1997) also considers a neoclassical production function to describe the aggregate production of the economy. He includes government size, measured as the share of government

consumption expenditure in GDP, as the institutional variable to assess the impact of government on economic growth. In his model, population is considered as the proxy for the labor force due to the difficulty of obtaining data on the labor force in developing countries.

Similar to Fosu (2001) and Guseh (1997) we are using a production function with three factors of production for country *i* at time *t*:

$$Q_{it} = f(K_{it}, L_{it}, N_{it}) \tag{1}$$

where Q is agricultural outcome measured as gross value added by agriculture to GDP; K is the stock of capital; L is the labor force in the agricultural sector; and N is agricultural land. Because the focus of this study is on the agricultural sector outcome we control for conventional factors that would affect agricultural production like labor and land. Dividing equation (1) by population, the production function becomes

$$Q' = f(K', L', N') \tag{2}$$

where Q' is gross value added by agriculture to GDP per capita; K' is the capital labor ratio; L' is the labor force participation rate in agriculture; and N' denotes agricultural land per capita. Subscripts are omitted for ease of notation. Because data on domestic investment in the agricultural sector of SSA countries are difficult to obtain, by convention foreign direct investment (FDI) is used as a proxy for capital. It is assumed that in the early stages of development, the priority of investment in developing countries would be the agricultural sector. Internal resources are either insufficient or not transformed to an effective investment due to the problems these countries usually face. Consequently, developing countries try to attract foreign funds to improve innovations and technology in this sector. Following Guseh (1997), we assume total population as a proxy for total labor force in the economy. Similarly we assume rural

population as a proxy for labor force in the agricultural sector. SSA countries are mostly agricultural base countries with high ratio of rural to urban population and therefore large agriculture labor force. We control the technology differences between countries by including cereal yield in the model, denoted by *A*, because cereals are the main staple in those countries. In order to examine the impact of institutions on agricultural outcome we include institutional variables in equation (2)

$$Q' = f(K', L', N', A, P, E, H) \tag{3}$$

where *P*, *E*, and *H* are matrices of institutional variables representing political, economic and health status of the countries, respectively.

The political institutions considered in this paper are the size of government measured by government spending, property rights measured by property rights index, and corruption status measured by freedom from corruption index in each country for 1995-2011. Larger share of government spending as a percentage of GDP implies more governmental commitment to economic activities. Higher levels of the property rights index imply that the government guarantees private property and higher scores for the variable freedom from corruption show less corruption in the government. Good governance practices, higher levels of property rights and less corruption would enhance the potential for the private sector to participate more effectively in the development process.

Economic Freedom index is used to explain institutional economic level. Higher levels of this index imply stronger presence of private sector in the market and more liberalized markets. Market liberalization policies in agriculture tend to increase agricultural production and enhance the economic incentives of farmers and private sector to participate more in economic activities

but the impact of such policies highly depends on the behavior of the marketing system and its environment. An encouraging external atmosphere and competitive internal structure helps participants to perform more efficiently (Getnet 2008). To control for other economic aspects of the countries, income level of the countries is considered in the model. Based on the definition made by the World Bank, sub-Saharan countries are categorized as middle income countries, fragile low income countries and low income countries[1]. Oil income is controlled by including a dummy variable in the economic institution variables matrix, *E*. Two countries, Republic of Congo and Gabon, have income from selling oil. We also controlled for income level by including two dummy variables representing middle income and fragile low income countries.

The infant mortality rate is considered as the institutional variable for health. Lower infant mortality rate reflects successful policies implemented in these countries to improve health status and quality of life. Because most of the SSA countries have a significant share of rural population, better quality of life and healthier life style would affect productivity of labor in agricultural sector and thus increase agricultural output.

We used panel data for 22 Sub-Saharan Africa countries for 1995-2011. Almost half of SSA countries are excluded from the data set due to the high amount of missing data.[2] Freedom from corruption, property rights, economic freedom indices, and government spending are obtained from the Economic Freedom of the World (EFW) database (EFW 2012). The rest of the data are obtained from the World Bank data base (World Data Bank 2012). Descriptive statistics of the data are presented in table 1.[3]

[1] The average of gross national income for the middle income group is U.S. $ 4000 per capita, for the fragile countries is U.S. $ 500 per capita and for the low income countries is U.S. $ 400 per capita (IMF 2012).
[2] See appendix for the list of the countries (table A-1) and map of the region (figure A-1).
[3] Detailed descriptive statistics are presented in the appendix table A-2.

Table 1 - Descriptive Statistics

Variable	Definition	unit	Mean	Std. Dev.	Min	Max
agvalue	Gross Value Added-Agriculture (constant prices 2005)	$billion	1.35	1.50	0.045	7.42
fdi	Foreign Direct Investment (FDI) (net inflows current prices)	$billion	0.40	0.95	-0.49	9.64
rurate	Rural population	% of total	64.48	17.75	13.85	91.71
agland	Agricultural land	sq. km	22953.65	21794.63	70	98125
cereal	Cereal production yield	kg/hectare	1254.34	670.30	110.1	4412.6
gs	Government spending	% of GDP	73.37	17.39	0	96.77
pr	Property rights index	0 - 100	42.18	16.26	5	75
ffc	Freedom from corruption index	0 - 100	31.07	12.06	10	70
ef	Economic freedom index	0 - 100	55.27	7.83	21.40	70.30
oil	oil selling countries	0 or 1	0.09	0.29	0	1
midinc	middle income countries	0 or 1	0.41	0.49	0	1
lowinc	low income countries	0 or 1	0.36	0.48	0	1
frag	fragile low income countries	0 or 1	0.14	0.34	0	1
mort	Infant mortality rate	per 1,000 live births	68.99	23.10	18.20	138.90
food	food production index	2004-2006=100	95.13	15.92	52.59	163.24

Results and Discussion

We use panel data for 22 sub-Saharan Africa countries for 1995-2011 to estimate equation (3). We consider a logarithmic functional form. All variables are in logarithmic form except three dummy variables of *oil*, *midinc*, and *frag*. The estimated model is:

$$agvalue_{it} = \beta_0 + \beta_1 fdipc_{it-1} + \beta_2 rurate_{it} + \beta_3 aglandpc_{it} + \beta_4 cereal_{it} + \beta_4 gs_{it} + \beta_5 pr_{it} + \beta_6 ffc_{it} + \beta_7 ef_{it} + \beta_8 oil_i + \beta_9 midinc_i + \beta_{10} frag_i + \beta_6 mort_{it} + \varepsilon_{it} \quad (4)$$

where *i* denotes countries in the sample and *t* denotes time. Dependent variable, $agvalue_{it}$, is the logarithm of gross value added by agriculture to the GDP per capita for each country during the

study period. The first three explanatory variables are considered as control variables affecting agricultural performance representing capital, labor and land, respectively. The variable $fdipc_{it-1}$ is the net inflow of foreign direct investment (current US$) per capita. It is included in the model with one year lag since it is assumed that the outcome of investment in agriculture would be realized at the end of the year. The percentage of the rural population is included in logarithmic form and denoted by $rurate_{it}$ which implies the ratio of agriculture labor to the total labor in each country. Share of each person from agricultural land of the country is calculated as the ratio of total agricultural land in square kilometers to the total population for each country and represented by $aglandpc_{it}$ in the model in the logarithmic form. Cereal yield is included to control for different technology of production in countries.[4] Political institution variables are denoted by gs_{it}, pr_{it}, and ffc_{it} measuring government size, property rights and freedom from corruption, respectively. Economic freedom index is considered as the economical institution variable and denoted by ef_{it} in the model. We control for the oil selling countries by including dummy variable oil_i, wich takes the value of one if the country has income from selling oil. Based on the World Bank classification of SSA countries' per capita income and institutional quality we define two dummy variables of $midinc_i$ and $frag_i$ for middle and fragile low income countries with average of annual $4000 and $500 per capita, respectively. The omitted group is low income countries with the average of annual $400 per capita. Health situation of the countries is represented by the variable $mort_{it}$, measuring the infant mortality rate per 1000 birth.

All explanatory variables were checked for endogeneity problems. Hausman test results show some evidence of endogeneity for infant mortality rate variable. Based on the Sargan test results, food production index is used as an instrumental variable for the mortality rate at birth. It

[4] Includes wheat, rice, maize, barley, oats, rye, millet, sorghum, buckwheat, and mixed grains (World Data Bank, 2012).

is assumed that rural population in countries with lower food production index are more subject to suffer from malnutrition. Chronic malnutrition and poor maternal nutritional status highly increase the risk of infant mortality.

We estimate random effects and fixed effects for equation 4. Both models were tested for heteroskedasticty and serial correlation. Results show that both problems exist in the models. Therefore, robust standard errors are used for fixed effects model to deal with heteroskedasticity. Random effects model is estimated using a generalized least squares (GLS) estimator in order to overcome serial correlation problem. Pesaran cross-sectional dependence (CD) test is used to test whether residuals are correlated across countries. Test results fail to reject the null hypothesis in the fixed effects model, thus there is no evidence of cross-sectional dependence. Using the Breusch-Pagan Lagrange Multiplier (LM) test, random effects model is preferred to Ordinary Least Square (OLS) estimator. Fixed effects and random effects models are tested for the preferred model using the Huasman test in STATA. The test result is in favor of random effects model. Table 2 presents estimation results for equation (4) for both fixed effects model and random effects model.

Results are consistent. Except for the property rights index variable, all other variables have the same sign in both models. Statistically significant variables are the same in both models except for the infant mortality rate which is only significant in the random effects model. In the fixed effects model, dummy variables representing income levels and oil selling countries are automatically omitted from the regression since they are time invariant. Hausman test result (last row of table 2) implies that the random effects model fits the data better than the fixed effects model.

Table 2 - Estimation Results for Random and Fixed Effects Models

Variables	Random effects	Fixed effects
FDI per capita	-0.036***	-0.036***
	(0.009)	(0.010)
Rural population ratio	1.395***	1.807***
	(0.311)	(0.380)
Agricultural land per capita	0.207**	0.578**
	(0.097)	(0.255)
Cereal production yield	0.063**	0.061*
	(0.029)	(0.032)
Government spending	0.195***	0.203***
	(0.042)	(0.045)
Property rights index	0.021	-0.033
	(0.038)	(0.048)
Freedom from corruption index	0.101***	0.076*
	(0.037)	(0.042)
Economic freedom index	0.119	0.285
	(0.164)	(0.198)
Oil selling countries	1.784***	-
	(0.540)	
Middle income countries	0.366	-
	(0.291)	
Fragile low income countries	0.495	-
	(0.365)	
Infant mortality rate	-0.697***	-0.899
	(0.124)	(0.181)
constant	0.581	2.067
	(1.342)	(2.036)
sigma_u	0.567	0.924
sigma_e	0.147	0.146
rho	0.938	0.976

Test: Ho: difference in coefficients not systematic
chi2(9)= (b-B)'[(V_b-V_B)^(-1)](b-B)=7.79
Prob>chi2 = 0.5552

Standard errors in parentheses
*significant at 10%, **significant at 5%, and ***significant at 1%

The sign for FDI per capita is negative which implies most of the investment made by foreign countries is in manufacturing and/or sectors other than agriculture. In other words,

foreign countries are most interested in industries other than agriculture to invest in SSA countries. Higher investments in other industries would change the allocation of resources against the agricultural sector. Absorbing other resources from the agricultural sector in the early stages of the development process is not in favor of overall economic development. Estimated coefficient for the FDI per capita variable suggests that one percent increase in foreign direct investments in other industries declines the value added to GDP by agriculture by less than 0.05 percent in the following year. Rural population, as the agricultural labor force, and agricultural land are two important production factors that are positive and significant in the model. The production technology of agriculture in SSA countries is assumed to be labor intensive and, thus, larger rural population means more family labor in the farm and higher production. The estimated coefficient for this variable suggests that one percent increase in the rural population ratio would increase the value added by agriculture to GDP by 1.4 to1.8 percent, ceteris paribus. If we assume the rural population as the agricultural labor, this result implies that utilizing the free capacity of the agricultural sector such that additional percent of labor is employed would raise the agriculture value added by almost 1.5 percent in the SSA countries. Larger agricultural land areas for each country lead to higher production of agricultural commodities and increase the value added by this sector to the GDP. However, based on the estimation results the effect of one percent additional land on agricultural value is lower than one percent additional labor. Countries with higher cereal yields are assumed to have relatively better technology of production and, thus, higher agriculture output value. As the positive and significant estimated coefficient for the variable cereal shows, those countries that have higher yields, representing better technology of production or even better climate, would have higher value added by agriculture to their GDP. The coefficients on government size and freedom from corruption

index are positive and significant. Those results highlight the important role of government in the agriculture sector in SSA countries and also show the impact of good governance on the agricultural development. Government spending in these countries helps to improve agriculture sector outcome and less corrupted countries have been more successful to increase the value added by agriculture sector to their GDP. According to the estimation results one percent additional government spending in the SSA countries would raise the value added by agriculture to the GDP by 0.2 percent, all other variables being constant. Similarly, improving the freedom from the corruption index by one percent, leads to an additional 0.1 percent of value added by agriculture to GDP. The coefficients on property rights and economic freedom indices are positive as expected but not significant. These results suggest that agriculture production in SSA countries face such critical limitations and constrains in technology and also physical and human capital that even improving the property rights and economic freedom would not help to utilize the unused capacity of this sector. Lack of necessary machinery, chemicals and fertilizers, and human capital constrained farming no matter if farmers own the land or not. Most of the farms produce at the subsistence level and free markets would not incentivize them to increase their production. The estimated coefficient for the dummy variable representing oil selling countries is significant and positive. It shows that countries that generate income by selling oil have 1.7 percent higher value added to the GDP by the agriculture sector relative to other countries. The variables for income level suggest that countries with higher per capita income tend to have higher agricultural outcome value. The estimated coefficients for those variables are not significant, though. The coefficient on mortality rate is negative and significant which implies that countries with lower health status would have lower agricultural value added to GDP. The

magnitude of the estimated coefficient suggests that one percent increase in infant mortality rate causes a 0.7 percent decline in the value added by agriculture to GDP in the SSA countries.

Conclusion

Increase in the agricultural output and productivity expands food supplies; expands exports and therefore generates more exchange rate earnings; provides labor force for other growing sectors of the economy; increases net cash income of the farms; and accumulates necessary capital for expansion of the industry. Each process mentioned above can contribute to the overall economic growth of the country. Lack of technical, educational and institutional inputs lowers the productivity of conventional inputs in agricultural sector of the developing countries. Institutions foster the process of transforming the potential for capital accumulation and savings from increased agricultural productivity into actual increase in investment. In this study we focus on the impact of political, economic and health institutions on the outcome of the agricultural sector in SSA countries.

Indicators show that many SSA countries suffer from governance problems like political instability, corruption, military governments, and ethnic conflicts while good governance can foster the development process in these countries. Government size, measured as the share of government spending from the GDP, has a positive effect on the value added by the agriculture to the GDP. This result suggests that expenditure by central and local governments which usually tends to provide infrastructure, is enhancing the outcome of the agricultural sector in SSA countries. One of the most important measures of good governance is the freedom from corruption index. Less corrupt governments would allocate resources in a more effective and efficient way with less discrimination. Results show that improvements in controlling and

lowering corruption increase agricultural sector outcome. Most of the SSA countries suffer from corrupt or instable governments. Improvements in the governance status would affect the agricultural sector as the first step of the development process. Secure property rights usually incentivize the private sector to invest in the economy, which in turn would help the overall economic development, but only when other factors of growth including political situations are favorable.

The agricultural sector in SSA countries faces serious problems in supplying physical capital, like credit, machinery and chemicals as well as human capital. Furthermore, high investment risks due to the lack of security and political instability in many countries decreases the impact of factors like property rights and economic freedom on agricultural development. In the early stages of the developing process, having a strong productive agricultural sector that can support other manufacturing and industrial sectors is the precondition for economic development before providing liberalized markets and trade freedom.

The health situation of the SSA countries, especially in rural areas severely affects the outcome of the agricultural sector. High mortality rate, malnutrition and lack of access to improved water and sanitation are major problems of rural areas in SSA countries. Malnutrition would adversely affect the labor productivity and lower the quantity and quality of agricultural products. Decreased production of food and income would intensify the malnutrition problem, forming a vicious circle.

All in all, it seems that political development is prior to economic development in SSA countries. Righteous governments that prefer national interests to their own political benefits and/ or ethnical conflicts can fight corruption and discrimination in resource allocations. Political

instabilities and military governments do not help the development process if not stop it. Programs focusing on improving good governance indicators, enhancing sanitation and nutrition, and providing necessary production inputs for the agricultural sector in the SSA countries would help their agricultural development process and ultimately their economic development.

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Appendix

Table A-1 List of Sub-Saharan Africa Countries

Angola	Gabon*	Rwanda*
Benin	Gambia, The	Sao Tome and Principe
Botswana*	Ghana	Senegal*
Burkina Faso	Guinea*	Seychelles
Burundi	Guinea-Bissau	Sierra Leone
Cameroon	Kenya*	Somalia
Cape Verde*	Lesotho*	South Africa*
Central African Republic	Liberia	South Sudan
Chad	Madagascar*	Sudan
Comoros	Malawi*	Swaziland*
Congo, Dem. Rep.	Mali	Tanzania*
Congo, Rep. *	Mauritania*	Togo
Cote d'Ivoire*	Mauritius	Uganda*
Djibouti	Mozambique*	Zambia*
Equatorial Guinea	Namibia*	Zimbabwe*
Eritrea	Niger	
Ethiopia*	Nigeria	

* Included in the sample

Table A-2 Detailed Descriptive Statistics

Variable		Mean	Std. Dev.	Min	Max	Obs.
Agricultural value	overall	1.35E+09	1.50E+09	4.50E+07	7.42E+09	N = 374
	between		1.49E+09	6.79E+07	4.81E+09	n = 22
	within		3.86E+08	-1.74E+08	3.96E+09	T = 17
FDI per capita	overall	3.97E+08	9.48E+08	-4.89E+08	9.64E+09	N = 374
	between		6.49E+08	2.94E+07	3.13E+09	n = 22
	within		7.03E+08	-2.91E+09	6.92E+09	T = 17
Rural population	overall	64.47931	17.75016	13.8522	91.706	N = 374
	between		17.98536	18.36772	86.90047	n = 22
	within		2.338921	57.78316	71.59376	T = 17
Agricultural land	overall	22953.65	21794.63	70	98125	N = 374
	between		22266.3	73.23529	97513.24	n = 22
	within		696.2088	19410.89	26313.24	T = 17
Cereal production yield	overall	1254.343	670.3042	110.1	4412.6	N = 352
	between		608.4738	353.225	2859.094	n = 22
	within		308.0416	-182.6506	2807.849	T = 16
Government spending	overall	73.36746	17.39388	0	96.7656	N = 374
	between		15.05686	33.17176	90.57647	n = 22
	within		9.250021	23.36157	106.0616	T = 17
Property rights index	overall	42.18182	16.25992	5	75	N = 374
	between		13.87353	19.70588	70.29412	n = 22
	within		8.953577	18.65241	72.47594	T = 17
Freedom from corruption index	overall	31.06711	12.05941	10	70	N = 374
	between		10.26651	14.64706	55.05882	n = 22
	within		6.674529	6.008289	54.83182	T = 17
Economic freedom index	overall	55.26704	7.831128	21.4	70.3	N = 374
	between		6.923943	36.86471	66.1	n = 22
	within		3.929633	39.80233	69.97216	T = 17
Oil selling countries	overall	0.0909091	0.2878649	0	1	N = 374
	between		0.2942449	0	1	n = 22
	within		0	0.0909091	0.0909091	T = 17

Middle income countries	overall	0.4090909	0.4923247	0	1	N = 374
	between		0.5032363	0	1	n = 22
	within		0	0.4090909	0.4090909	T = 17
Low income countries	overall	0.3636364	0.4816901	0	1	N = 374
	between		0.492366	0	1	n = 22
	within		0	0.3636364	0.3636364	T = 17
Fragile low income countries	overall	0.1363636	0.343634	0	1	N = 374
	between		0.3512501	0	1	n = 22
	within		0	0.1363636	0.1363636	T = 17
Infant mortality rate	overall	68.99385	23.09886	18.2	138.9	N = 374
	between		19.39264	27.75882	103.3294	n = 22
	within		13.1763	20.88797	121.688	T = 17
Food production index	overall	95.13315	15.91831	52.59	163.24	N = 352
	between		4.203305	86.2125	104.7212	n = 22
	within		15.3779	47.46315	158.1132	T = 16

Figure A-1. Map of Sub-Saharan Africa Countries
Source: Australian Government Website (http://australia.gov.au/)