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Research Article

DOES AGRICULTURAL PRODUCTION CONTRIBUTE TO POVERTY REDUCTION IN CAMEROON?

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ABSTRACT

The paper investigated the contribution of agricultural production to poverty reduction in Cameroon using an extended generalized Cobb Douglas production function that was linearised by natural logarithm to appropriate it for multiple regression usage. The OLS estimation technique was then used to exploit data about the variables from World Development Indicators from 1980 to 2013. The results were significant at 1 % and show that 94.73% of the independent variables were responsible for expressing changes in the dependent variable. Food production positively but insignificantly contributed to poverty reduction whereas livestock production, household final consumption had a positive and significant contributions to poverty reduction by raising the gross national income per capita. Net official development assistance and official aid contribute negatively to poverty reduction in Cameroon. We therefore recommend that more concrete policies and investments aimed at supporting livestock and food farmers with financial, infrastructural and technical assistance be drafted and implemented through good governance, transparency and good faith for long term projects in the sector as some of the dreams for Cameroon to realize its new generation agriculture and the 2035 vision.

INTRODUCTION

Cameroon has been among the most prosperous and stable countries in Africa, thanks to relatively abundant agricultural land and offshore petroleum. These conditions spurred up an economic boom from the re-unification of the country in 1972 until 1986, followed by a decade of decline from 1986 to 1995, and a limited recovery since then (Bamou and Masters, 2006). The recovery has been significant, but poverty remains widespread. In 2001, 17% of the population had incomes below one dollar per day in purchasing power parity terms, and 51% had incomes below two dollars per day (World Bank, 2006). However, financial and fiscal recoveries after 1995 were reflected in rising living standards. For example, the poverty index decreased by about 13% between 1996 and 2001 (World Bank 2005), largely thanks to the recovery of the agricultural sector which had registered remarkable growth but still had not brought the country's food production per capita back to the level enjoyed in the early years of independence.

Prior to the economic crisis of the late 1980s, Cameroon's development strategy efforts were managed through a series of five year development plans. In the plans, the agricultural sector was described as the priority sector and the government intervened massively in rural development, both directly through the establishment of state-owned agro-industries, rural corporations and settlements, and also indirectly through various support programs (Bamou and Masters, 2006).

At independence, about 85% of the population lived in rural areas and relied principally on agriculture for their livelihoods. Since then, the country has urbanized faster than most other African countries. By 2005, the share of the population living in rural areas was estimated to have fallen below 50%, as compared to an African average of 64% (FAOSTAT 2006). As oil exports grew after 1977, the resulting Dutch disease contributed to stagnation in both industry and agriculture, with a boom in the oil and service sectors that at times generated more than two-thirds of gross domestic product (Benjamin and Devarajan 1989, Blandford *et al*., 1995).

Agricultural production in general witnessed a poor performance since the discovery and exportation of crude oil in 1977. Its growth rate of 10% during the first decade after independence had reached 7% between 1975 and 1982. Since then, production in the sector remained stagnant between 1982 and 1988 before the severe drop of 1989. Apart from banana

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and rubber, productions of the other products were 20-50% less than the projections of the 5th five years development plan (Heidhues F. and Kamajou F., 1994).

The agricultural sector in Cameroon is characterized by large public and private owned commercial farms and smallholder subsistent farms. Commercial farms produce export crops like cocoa, cotton, rubber, sugarcane, banana, oil palm, tea and tobacco. Smallholder farms produce staple food with 72% growing maize or sorghum, 71% groundnut, 58% root crops like taro or coco yam, 56% plantain, 53% bean or cowpea and 52% vegetables. Nearly 70% of the food produced is eaten on-farm (INS, 1999). Rice is grown by an estimated 145,000 farmers on about 44,000 hectares, mainly in the irrigated schemes in the north. As these production areas are far away from the centers of consumption in the south (Yaoundé and Douala), most rice is exported to the neighboring countries of Nigeria, Chad and the Central African Republic (MARD, 2009).

The Government adopted the rural sector development strategy in 2005 where it noted that its agriculture was in bad shape, structurally unable then to feed the Cameroonian population. Thus the 2005 production strategy was aimed to ensure food security and self-sufficiency for households and the nation; contribute to economic growth and particularly to the growth of foreign trade and employment; increase the incomes of rural producers; improve the living conditions of the rural population, and ensure better use and sustainable management of natural capital as a production base (GESP, 2010).

The implementation of the strategy was carried out in a context marked by food and financial crises. It was intended to raise the production of major food crops as cereals estimated at 1686 tons in 2005 to 3294 tons in 2015, roots and tubers from 3836 tons in 2005 to 6319 tons in 2015 vegetables and fruits from 1405 tons and 2282 tons in 2005 to 2400 tons and 4076 tons in 2015 respectively (SDSR, 2005). However, the results obtained were still below expectation as production of export and food crops remained insufficient; living conditions of the rural population still precarious; access to funding and the market continues to be limited; and the institutional framework was unfavorable for the sector's development (GESP, 2010). However, in 2008, agriculture contributed more than 41% of GDP and employed about 70% of the country‘s working population (INS, 2008 and DESA, 2009). In Cameroon and other African countries like Ghana and Mali agricultural performance remained substantial over the last two decades (Dewbre and Battisti, 2009). The substantial performance was due to increasing per capita incomes which boosted domestic demand for agricultural produce and prompted major re-orientations of macroeconomic and agricultural sector policies.
Despite a decade of economic growth, poverty rates remained almost unchanged between 2001 and 2011. After a large decline between 1996 and 2001, poverty incidence remained broadly constant. Although poverty decreased from 39.9% in 2007 to 38.7% in 2011, the rate of decline did not keep up with demographic growth and the number of poor thus increased. There were net increases in the poor population in both urban and rural areas. Poverty declined in urban areas from 12.2% in 2007 to an estimated 10.8% in 2011. During this period, however, the urban population increased from approximately 8.4 million to 10 million mainly because of internal migration, resulting in a small increase in the urban poor population. In rural areas, the percentage of the poor population increased from 55% in 2007 to 59.2% in 2011, which translated into more than one million additional rural poor coupled with an increasing number of refugees (IMF, 2014).

While the availability of food is sufficient at most times of the year in some regions of the country, analysts have agreed that the consequences of the availability status quo are at stark. The World Food Program (WFP) and the FAO found in their 2011 *Comprehensive Food Security and Vulnerability Analysis* that, at any given time, at least 30% of Cameroonian households in rural and urban areas remain vulnerable to food insecurity. Over 48% of the working population in Cameroon depends on agriculture and on pastoral activities, yet it is estimated that only 20% of the country’s arable land is currently cultivated (FAO, 2012). Of over the 22 million Cameroonians, at least eight million live in rural areas. The majority of these rural people, over 55% fall below the national poverty line of US $1.25 per day, (IMF, 2010). The results of a recent large-scale food security study show that nearly 10% of households in rural Cameroon were food insecure due to inadequate food production in the poor areas (PAM, 2011). The WFP/FAO (2011) also found out that an additional 10% of rural households were in a persistent state of relative food insecurity. People suffering from such productivity and health-sapping conditions are forced to skip meals, to reduce the size of their meals or to buy the cheapest available food items. Food security experts have concluded that without renewed efforts to scale up the domestic availability of food beyond present levels, rural Cameroonians may continue to have deficient access to adequate food.

The issue of poverty reduction is recently emerging as a major concern at national and international policy discourse after many decades of its relegation (Njimanted, 2006). As a result one of the vital targets of the MDGs was to reduce extreme poverty and hunger by half between the years 2000 and 2015. Angaye (2005) pointed out that poverty was engulfing more and more of the world’s human population. By his view, the number of the poor in the world stood at about 1 billion in 1994, 1.3 billion in 1995, 1.74 billion in 1994, 2.04 billion in 2000, 2.56 billion in 2002, and has continued to increase despite all developmental efforts put in place by both governments and non-government organizations (NGOs) to eradicate poverty. Oni (2014) observed that while the numbers of poor in the advanced countries of the world was reducing considerably over the years, the reverse was true with developing countries. Poverty in developing countries took various forms and dimensions.

In Cameroon, from 2001 to 2007, the national proportion of people living below the poverty line remained virtually stable, dropping from 40.2% to 39.9% (GESP, 2010). It was based on such observation that; reducing poverty to a socially acceptable level was set as one of the main goals of the GESP. With respect to the goal, the GESP earmarked reducing income poverty rate from 39.9 per cent in 2007 to 28.7 per cent in 2020.

In Cameroon, agriculture has for long been a prioritized economic sector and it is believed that agriculture-led development is fundamental to cutting hunger, reducing

poverty, generating economic growth, reducing the burden of food imports and opening the way to the expansion of exports (Sneyd, 2014). Therefore, improving upon agriculture would substantially contribute in eradicating poverty in the country. It is based on this premise that the current study is necessitated. Hence, the work is intending to investigate whether agricultural production contributes to poverty reduction in Cameroon. Specifically it intended to determine whether food and lives stock production contribute to poverty reduction in Cameroon

LITERATURE REVIEW

The Concepts of Poverty

Poverty is not an easy concept to define, thus a range of definitions exist, influenced by different disciplinary approaches and ideologies. The dominant western definition since World War II considered poverty in monetary terms, using levels of income or consumption to measure poverty (Grusky and Kanbur, 2006) and defined the poor by a headcount of those who fall below a given income/consumption level or 'poverty line' (Lipton and Ravallion, 1993). However, this economic definition has been complemented in recent years by other approaches that define poverty in a more multidimensional way. Adam Smith defined poverty as "the inability to purchase necessities required by nature or custom" (Smith, 1776)

Currently, poverty is the situation where "a person's resources (mainly his material resources) are not sufficient to meet minimum needs (including social participation)" (JRF, 2013). The World Bank (2004) defined poverty as "pronounced deprivation in well-being, comprising many dimensions. It includes low incomes and the inability to acquire the basic goods and services necessary for survival with dignity. Poverty also encompasses low levels of health and education, poor access to clean water and sanitation, inadequate physical security, lack of (political) voice, and insufficient capacity and opportunity to better one's life".

A definition of poverty which attempts to encompass both the developing and developed country contexts was published in the Copenhagen Declaration of the United Nations in 1995. By such a declaration, poverty is a situation described as lack of income and productive resources to ensure sustainable livelihoods; hunger and malnutrition; ill health; limited or lack of access to education and other basic services; increased morbidity and mortality from illness; homelessness and inadequate housing; unsafe environments and social discrimination and exclusion. It is also considered as the lack of participation in decision making in civil, social and cultural life (United Nations, 1995).

Absolute Poverty

Absolute poverty is a condition characterized by severe deprivation of basic human needs. It depends not only on income but also on access to services (United Nations, Copenhagen Declaration, 1995). Concern about absolute poverty is naturally greater where there is a risk of destitution than where all have access to means of survival (Laderchi *et al*., 2003). The World Bank sees absolute poverty as a condition of life degraded by diseases, deprivation and squalor, among other things. In general, absolute poverty refers to lack of adequate resources to afford a commodity basket that guarantees the attainment of an objective minimum acceptable standard of living (Olowononi, 1997).

Relative Poverty

Relative poverty is deprivation relative to the standard of living enjoyed by other members of the society. Even if basic needs are met, a segment of the population may still be considered "poor" if they possess fewer resources, opportunities and goods than other citizens. Hence, it is a standard which is measured in terms of the society in which an individual lives and which therefore differs between countries and over time. Relative poverty connotes the inability of certain regions of a society to earn adequate income to satisfy their basic needs according to what is obtained in the better-off regions (UNDP, 1997).

Situational Poverty

Situational poverty refers to people living in poverty for a short time as the result of circumstances such as; unemployment, chronic illness, disability, divorce, or death of a family member. Here, it is believed that there is no single path into or out of poverty hence, many events throw people into poverty and many events help people exit poverty. Trigger events like changes in household composition, employment status, and disability status, are often the cause for entry to and /or exit poverty (The Urban Institute, 2002). In the US, a change in employment status is the most common event associated with poverty entry. Nearly 40% of those entering poverty had a household member losing a job. A change in disability status plays the next largest role (11% of those entering poverty), followed by a young child entering the household (8%), a shift to a female-headed household (6%), and a young adult setting up his or her own household (2%).

Generational Poverty

Generational poverty is the art of people living in poverty for two or more generations. A family may fall into poverty for one generation due to situational circumstances, but it may maintain the support system and connections common among most middle and upper-class families. When the poverty persists beyond one generation, the effects become cumulative and more severe; many of the typical support systems dissolve. Individuals in generational poverty often do not see a choice, or how to access proper resources. It is believed that, being in poverty is rarely about a lack of intelligence, ability or motivation hence, improvement in human capital (education) is considered as a key gateway out of generational poverty.

Monetary Poverty

According to Laderchi *et al*., (2003), the monetary approach looks at poverty in terms of how much a person's income (or consumption) falls short of some minimum level of resources. By the approach, a person is considered to be poor if, and only if, the income level is below a defined poverty line. The monetary approach emphasizes on the choice of income or expenditure indicator as a proxy for consumption and as a proxy for permanent income. Thus, monetary poverty as a proxy by either expenditure or income is measured as the total income or consumption.

Capability Poverty

Capability poverty is the failure of a person to achieve basic capabilities to adequately fulfil certain crucial functions at

minimal level (Saith, 2001; Sen, 1985). The capability approach views monetary resource as means that can help enhance people's well-being. The monetary resource is viewed as a necessary, but not sufficient condition to prevent the casual chain of poverty (Laderchi *et al*., 2003). Therefore, the capability approach emphasizes both monetary resources and other resources to develop or achieve capabilities. Sen (1985) argued that the monetary approach emphasizes utility of a commodity and does not provide a good proxy to assess people's well-being. Sen's concept of capability operates at two levels: at the level of realized well-being or outcome measured by functioning, and at the level of potential well-being or opportunity measured by capability. Functioning refers to a person's achievement while capability refers to the combination of various functions a person can achieve. A capability model emphasizes the fact that the development of human capital or capability is influenced by availability of financial resources and other social or environmental factors.

Social Exclusion Poverty

Social exclusion is a situation whereby an individual is denied the opportunity to participate in the normal activities as other citizens whether the desire to participate is there or not (Silver and Miller, 2002). As a relational process, social exclusion theory views poverty as a declining participation and access to resources. Social exclusion poverty is operational in terms of median income. Hence, it is the relative position of the individual in a society with regard to median income. Any person or family whose income falls below the population median income is considered poor. Social exclusion researchers have emphasized median income as an appropriate proxy to analyze the experience of social exclusion poverty (Atkinson and Hills, 1998).

The various concepts of appreciating poverty usher in many ways of evaluating poverty. For instance, the measures by the poverty line (Ravallion, 1992; Ravallion *et al*., 2009), the poverty gap index (work Bank, 1993 and Anyanwu, 1997), the head count index (Ezeanyeji and Ozughalu, 2014), the Foster-Greer-Thorbecke Index (Adeyeye, 2001 and Datt, 1998), and the Sen index (Anyanwu, 1997) all have the common expression of exposing the misery and unacceptable living conditions of man. Though, the various ways may differ in content and ideology, each tries to look at the practical accepted norms for people to live out of physical and psychological situations that lack basic and necessary needs.

Fundamental Theories of Poverty

The Vicious Circle of Poverty Theory

The theory was developed by Ragnar Nurkse (1953). To him a society is poor because it is poor. A low income society faces low savings implying low investments and consumption thus low production and eventually back to low income. Like father like son if the father was a poor man so the saying goes. However, the theory is criticized for not revealing the historical causes of poverty.

The Marxists Theory of Poverty

The Marxists theory holds that poverty is a product of exploitation of labourers that emanates from the dichotomy of a few rich persons within a capitalist setting. By it, technological progress aggravates poverty as it makes production more capital intensive, thus laying-off workers to redundancy. Such a situation leads to a disequilibrium between supply and demand, with supply out stripping demand causing a drastic reduction in wages (Duru, 2003). But since there is no increasing misery of labourers in capitalist societies, it is criticize on such grounds (Jhingan, 2003)

The Power theory of Poverty

According to the theory, poverty is a necessary result in an economy where a few persons possess much power to organize and direct the economic mode of production on a self-interest basis (Njimanted, 2006). Religion is held as sustaining power between the rich and the poor by denying the poor opportunities (1995, and Duru, 2003)

The Natural Circumstantial Theory of Poverty

The theory sees poverty as the effect of geographical location, endowments and physical disabilities. It identifies some geographical locations, inadequate natural endowment in human residents, unemployment, and old age, physically affected and mental disabilities as explanatory variables for the existence of poverty in some parts of the world. The theory therefore, suggests that for poverty to be eradicated, sectional welfare measures must be provided to the poor by properly targeting the causes of poverty by any policy aimed at alleviating poverty. However, it has been criticized as an approach based on top- to-bottom supply driven manner to reducing poverty instead of bottom-up demand driven mechanism where the poor prioritize their needs in terms of what they lack. Experience has shown that those who are victims of transitory poverty such as communal wars and other forms of natural disasters and those who benefit from welfare packages of poverty reduction usually tend to be lazy and unproductive in the long run when these welfare packages are not forthcoming

The trickle-down theory of Poverty

Proponents of the trickle- down theory of poverty argue that there exist some transmission mechanisms between macroeconomic variables and the level of poverty in an economy (Njimanted, 2006). The hypothesis of the trickledown theory is that; the rapid growth of per capita income is associated with a reduction in poverty. The trickledown theory has been interpreted to suggest that growth in the agricultural output without radical institutional reforms will reduce the incidence of poverty. Hence, with the existence of the trickle down mechanism, a rise in agricultural production and income levels per head would lead to some decline in rural poverty.

However, the potential for trickle- down has been challenged by the fact that agricultural expansion might have some links with income generation for the poor only up to the 1960s when there was increased use of labour, thus benefiting the poor. According to Bardhan (1996), such a mechanism prevented the trickle- down effects from the mid 1960s in developing countries. Firstly, the adoption of labour displacing machineries created misery among a section of wage labourers. Secondly, the increased profitability of self cultivation by large land lords led to the eviction of small farmers. Also, the increased dependence of agriculture on purchased inputs and privately managed irrigation drove farmers with fewer

resources out of cultivation. The displaced farmers overtime swelled the ranks of agricultural labour. The emergence of classes of rural rich after the green revolution caused a shift in the demand pattern away from local handicraft and services and it led to the impoverishment of the village artisan. Rapid agricultural growth in selected areas induced immigration of agricultural labour from backward areas. The increased use of pump sets by richer farmers resulted in some areas to a drop in water tables and as a result, traditional lift irrigation technology used by poorer farmers became less effective. Further, the large farmer is no longer interested in the maintenance of old irrigation channels and the small farmer alone is not in a position to mobilise adequate resources for the purpose. Moreover, the new technologies have brought about a decline in the earnings of the relatively poor household. Lastly, the increased political bargaining power of the rural rich has resulted in higher administered prices of food grains while wages of agricultural labourers have shown a tendency to lag behind the price rise.

Literature on poverty reduction is unanimous in concluding that the sector composition of economic growth makes a significant difference in poverty reduction. Most studies also have come to the conclusion that growth in agriculture is highly beneficial for poverty reduction although its importance diminishes as economies grow and become more diversified (Grewal *et al.,* 2012). Byerlee, de Janvry and Sadoulet, (2009) Timmer (1988) and Cervantes and Brooks (2009) all noted that a declining share for agriculture in national employment and GDP is an inevitable consequence of economic progress. This is largely due to higher income elasticity of demand for non-agricultural goods and services. As incomes grow, consumers increase their consumption of manufactured goods and services faster than the consumption of food. Paradoxically, the process is usually accompanied by rising incomes and a lower incidence of poverty among those who depend on agriculture for a living. However, based on the examination of a sample of 25 countries with Cameroon inclusive, Cervantes-Godoy and Dewbre (2010) found that growth in agriculture plays a leading role in the reduction of extreme poverty (i.e. income ≤ US$1.25 per day), but non-agricultural growth is more powerful in reducing poverty among the better-off poor (i.e. in reducing the US$2.00 per day poverty headcount). They found that the dominance of agriculture in reducing extreme poverty declined as countries became richer and as income inequality increased. They also found that more than 52% of the average poverty reduction in 12 of the 25 countries was due to agricultural growth and Cameroon was among the 12 countries, while remittances contributed to 35% of the reduction and the rest was due to non-agricultural growth. A further finding was that high initial income inequality in a country reduced the impact of agricultural growth on poverty reduction.

Irz *et al.*, (2001) ran a cross-country regression to investigate the impact of improvements in agricultural land productivity, agricultural labor productivity, and a combination of the two on headcount poverty using a sample of 40 countries, including 18 from sub-Saharan Africa. They concluded that there is a significant relationship whereby increases in yields are an important determinant of poverty, but acknowledged the results could have been biased due to the omission of some vital variables in their model.

Sarris *et al.*, (2006) explored how farm productivity affects poverty, and how various factor market constraints affect farm productivity using OLS regressions. The empirical analysis drew on representative surveys of farm households in Kilimanjaro and Ruvuma, two cash crops growing regions in Tanzania indicated that poorer households do not only possess fewer assets, but are also much less productive as verified in the case of exports in Cameroon (Ofeh M. A., 2014). Also, they found that agricultural productivity directly affects household consumption and hence overall poverty and welfare. Kolawole and Olufunsho (2014) using the error correction mechanism (ECM) investigated the impact of the agricultural sector on poverty reduction in Nigeria over the period 1986 to 2012. The results revealed that food production index and government spending had negative impact on poverty headcount ratio in the country. In addition to crop production, livestock production was found to be an important contributor to poverty reduction in developing countries. The assertion was verified by Sharma and Kumar (2011) in India, concluding that rapid growth of the livestock subsector benefited the poorest households the most. The subsector also has a special role in promoting gender and social equity, since around 60% of their total work force was made up of women.

Grewal *et al.*, *(*2012) also supported by concluding in their findings that the extent to which poor people benefit from agricultural growth depends on the rate and nature of their participation in agriculture. The allegation is verified in many developing countries but could vary depending on the type of agriculture or the ownership structure in a given location. For instance in India, rapid growth rates in livestock agriculture have contributed to poverty reduction because of the high labor intensity practices.

Other studies have suggested that when growth in agriculture is accompanied by investment in infrastructure, education and health, its effect on poverty reduction is further enhanced. Habito (2009) analyzed and found only weak evidence of any systematic relationship between sector growth and poverty reduction, especially for agriculture and services. However, by using multiple-regression equations it was found that the joint effect of agriculture-driven growth, good governance and social expenditures by the government appear to explain well the variation in poverty elasticity of growth across Asian countries. Contrary to the puzzling results obtained under pair-wise correlation analysis, the role of agriculture recently emerged as a significant determinant of the poverty elasticity of growth, in the expected direction, even though, its impact was still considerably weaker than those of governance and public expenditures on education and health, with governance having the strongest effect.

METHODOLOGY

The scope chosen is based on the fact that it coincides with the era in which many economic policy reforms have been put in place in Cameroon to boost the country's agricultural sector and fight against poverty. The data used is secondary from the world development indicators of the World Bank (2015).

Model Specification

We got inspiration from the neoclassical Cobb-Douglass production function

$(Y = f(AL^{\alpha}K^{\beta}))$ and adapting to our case gives equation 1.

Income or Monetary Poverty =

$$\left(Afpi^{\ 1}lpi^{\ 2}hfce^{\ 3}ggfce^{\ 4}nofd^{\ 5}sevp^{\ 6} \right) \quad (1)$$

In the study, income poverty was measured by gross national income per capita (gni pc). Hence, equation (1) becomes:

$$gni\ pc = \left(Afpi^{\ 1}lpi^{\ 2}hfce^{\ 3}ggfce^{\ 4}nofd^{\ 5}sevp^{\ 6} \right) \quad (2)$$

To obtain a linear model, we present all the data series in natural logarithm, which brings all values to the same unit. Hence, the functional relationship among the variables is expressed in equation 3.

$$lngni\ pc = lnA+\beta_1 lnfpi+\beta_2 lnlpi+\beta_3 lnhfce+\beta_4 lnggfce+\beta_5 lnnofd+\beta_6 lnsevp \quad (3)$$

Letting $\ln A=\beta_0$, and substituting it in (3), we have equation 4.

$$lngni\ pc = \beta_0+\beta_1 lnfpi+\beta_2 lnlpi+\beta_3 lnhfce+\beta_4 lnggfce+\beta_5 lnnofd+\beta_6 lnsevp \quad (4)$$

Considering Ravallion *et al* (2008) and following that poverty is determined by various factors, equation (4) is modified to include an error term and time factor is specified to capture the effects of fiscal, socio-economic and agriculture indices on gross national income per capita in equation 5.

$$lngni\ pc_t = \beta_0+\beta_1 lnfpi_t+\beta_2 lnlpit+\beta_3 lnhfce_t+\beta_4 lnggfce_t+\beta_5 lnnofd_t+\beta_6 lnsevp_t +\varepsilon_t \quad (5)$$

With the expectation that $\beta i \geq 0$ where, i= 1, 2, 3..... 6., β_0 is a constant as t is time and ε_t is the error term. Equation (5) becomes the econometric model adopted for OLS regression in the analysis where:

lngni pc_t= Natural log of Gross National Income Per Capita used as proxy for income poverty.

$lnfpi_t$= Natural log of Food Production Index used as proxy for food production, $lnlpi_t$= Natural log of Livestock Production Index used as proxy for livestock production, $lnhfce_t$= Household Final Consumption Expenditure, $lnggfce_t$= Natural log of General Government Final Consumption Expenditure, $lnnofd_t$= Natural log of Net Official Development Assistance and Official Aid Received, $lnsevp_t$= Natural log of Secondary Education Vocational Pupils and ε_t= Stochastic or Error term.

RESULTS

Pre-tests about the variables used in the specified model were done by investigating for stationarity (unit root) and determining the nature of distribution of the variables (Jarque Bera test) to avoid spurious results.

Trend Analysis

Figure 1 is a two-way graph representing the evolution of gross national income per capita in Cameroon throughout the period of study. It shows that from 1980, GNI per capita was on a steady rise till the late 1980s when it started falling probably due to the severe economic crisis facing the country. The fall in GNI per capita persisted till the mid 1990s when the CFAF was devalued and since then, it remained rising steadily amidst little fluctuations.

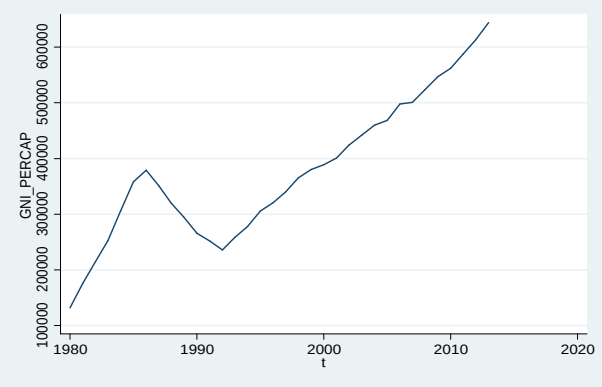

Figure 1 Trend of Gross National Income Per Capita between 1980 and 2013

Source: Generated by author using STATA 13

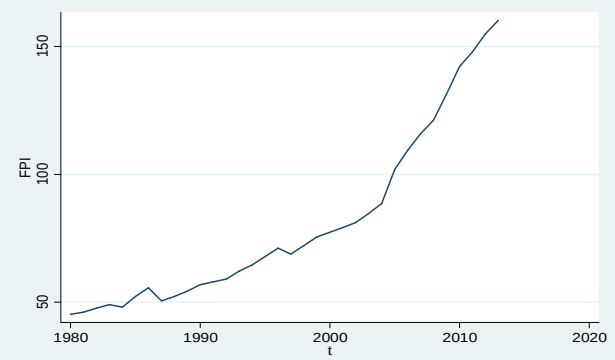

Figure 2 Trend of Food Production Index between 1980 and 2013

Source: Generated by author using STATA 13

Figure 2 represents the evolution of food production index in Cameroon from 1980 to 2013. We can observe that the food production index was very low in the early 1980s though on a continuous rise. The low value was probably due to the oil boom of the late 1970s that led to the abandonment of agriculture, followed by the economic crisis of the late 1980s that negatively affected all production activities in the country. It was until the late 1990s, that there was a steady rise and the increase became more consistent by the mid-2000s and since then, the food production index has witnessed a continuous increase.

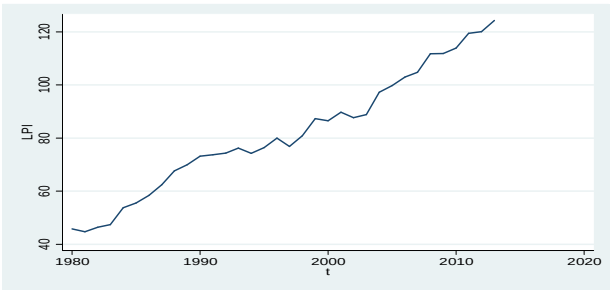

Figure 3 Trend of Livestock Production Index between 1980 and 2013.

Source: Generated by author using STATA 13

The livestock production index represented in figure 3 has been unsteady, fluctuating throughout the period, though being a positive trend increasing in value.

Presentation of Regression Results

In order to do a better estimation we tested for the stationarity and realized that some variables were stationary at level while others after the first difference. As such, to ensure for reliability and predictability of the results, the difference regression was run using the ordinary least square technique. The results obtained are presented in the table 1.

Table 1 Presentation of Regression Results

Dependent variable :lngni pc Method : ordinary least square(OLS)				
Variables	**Coefficient**	**Standard Error**	**t-statistics**	**p-value**
Dlnfpi	0.27	.47	0.58	0.57
Dlnlpi	1.63**	.57	2.87	0.01
lnhfce	1.30 ***	.09	14.02	0.00
Dlnggfce	0.28	.41	0.67	0.51
lnnofd	-0.08**	.04	-2.15	0.05
Dlnsevp	0.06	.16	0.36	0.72
C	-2.05	.86	-2.39	0.03
R-squared		0.96		
Adjusted R-squared		0.95		
F-statistics		66.85		
P-value of F-statistics		0.00		

Source: Computed by author using STATA 13
Note: *** = significant at 1%, ** = significant at 5%, * = significant at 10%,

By the regression results obtained and considering the specification of equation (5) we have the following estimates of equation 6.

$$lngni\ pc = -2.046595 + 0.2730317lnfpi_t + 1.628187lnpi_t + 1.302848lnhfce + 0.2775461lnggfce - 0.0807589lnnofd + 0.056984lnsevp \quad (6)$$

Globally from the results (table 1), we notice that all the diagnostic statistics of the model are good as the adjusted R-squared (0.95) implies that about 95 % variation in the dependent variable is caused by changes in the independent variables. Also, the value of Prob (F-statistic), is 0.00, indicating that the results are globally significant at 1%., which is an exhibit of the reliability. To confirm that, we compare the prob (F.statistic) with the value of the chosen level of significance (p-value (0.00)), which is less than 0.1. As such, we conclude that the parameters are globally significant at 1%. Furthermore, we notice that one of the variables of interest (lpi) is significant at 5% level; meanwhile two of the control variables (lnnofd and lnhfce) have significant coefficients at 5% and 1%, level respectively. The results show a positive relationship between the dependent variable (lngni pc) and 05 out of the 06 independent variables considered in the model and a negative relationship between the dependent variable and (lnnofd). Therefore the results are in accordance with the a priori expectations except for lnnofd which is negatively related to the dependent variable. Lastly, the result show a negative constant term with coefficient -2.05. This means that there is still some possibility of a negative effect or drop in the gni pc in Cameroon that can lead to a rise in poverty to the magnitude of 2.05% if the variables specified in the model were to have zero coefficients.

Discussion of Results

The specific objectives of the study were to identify the respective contributions of food production and livestock production to poverty reduction in Cameroon. The OLS estimation technique was used to analyze the data and we used the food production index and livestock production index to capture food production and livestock production respectively. Also, GNI pc was used as proxy to capture monetary poverty such that an increase in the GNI pc would imply a reduction in poverty. Also, some control variables were added to the model.

The Contribution of Food Production to poverty reduction in Cameroon

By the regression results, the food production index has a positive coefficient which agrees with the a priori expectation. The coefficient of fpi was 0.27, indicating that a 1% increase in the food production index would lead to a 0.27 % increase in GNI pc thus a reduction in poverty. Also, the same coefficient indicates that a 100% increase in the fpi would lead to a 27.30% increase in the GNI pc and vice versa. However, the result was insignificant hence; we failed to reject H_o at 10% level of significance. Thus we came to the conclusion that food production does not significantly contribute to poverty reduction in Cameroon.

These findings are contradictory to those of Cervantes-Godoy and Dewbre (2010) who based his findings on a sample of 25 countries with Cameroon inclusive, found that growth in agriculture played a leading role in the reduction of extreme poverty, but non-agricultural growth was more powerful in reducing poverty among the better-off poor. However, the dominance of agriculture in reducing extreme poverty declined as countries became richer and as income inequality increased. This could justify the insignificant contribution of food production to poverty reduction in Cameroon as indicated by our results.

The findings of Byerlee, de Janvry and Sadoulet, (2009) Timmer (1988) and Cervantes and Brooks (2009) all proved that a declining share for agriculture in national employment and GDP was an inevitable consequence of economic progress. This may be largely due to higher income elasticity of demand for non-agricultural goods and services. As incomes grow, consumers increase consumption of manufactured goods and services faster than the consumption of food. In addition to the above and based on the realities of Cameroon, we can also justify the results arrived at to be due to the backward nature of agriculture especially that of the food production sub-sector dominated by small farmers with traditional methods of cultivation and being reluctant to apply modern production methods. Also, food crop farmers suffer from lack of adequate financial capital to embrace large scale production, and severe post-harvest losses due to the poor nature of farm to market roads, lack of adequate storage infrastructures among others which hinder production capacities and forcing farmers to operate at less than full capacity.

The Contribution of Livestock Production to poverty reduction in Cameroon

From the results, lpi had a positive relationship with GNI pc as expected, indicating that a higher lpi would lead to a higher GNI pc and a lower level of monetary or income poverty. The estimated coefficient of lpi (1.63) indicates that a 1% increase in lpi would lead to a 1.63% increase in GNI pc and a 100% increase in the lpi would lead to a 162.82 % increase in GNI pc. The increase in GNI pc implies a drop in monetary poverty

hence, from the results, we conclude that livestock production significantly contributes to poverty reduction in Cameroon at 5% level of significance. The results corroborate those of Sharma and Kumar (2011) verified in India that the rapid growth of the livestock subsector benefited the poorest households most. Furthermore, the majority of workers engaged in livestock belong to socially and economically backward communities. Sharma and Kumar results are supported by those of (Grewal *et al.*, 2012), all indicating that the extent to which poor people benefit from agricultural growth depends on the rate and nature of their participation in agriculture. This allusion remains very substantial in many developing countries, but can vary depending on the type of agriculture or the ownership structure in a particular locality. In India, rapid growth rates in livestock agriculture have contributed to poverty reduction because of the high labor intensity of the sub-sector that is lacking in Cameroon.

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