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Full Length Research Paper

Outcomes of Agricultural Development Initiatives in Guinea-Bissau: Growth Prospects and Poverty Reduction Strategies

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Promoted under the New Partnership for Africa's Development (NEPAD), the objective of the Comprehensive Africa Agricultural Development Program (CAADP) is to increase the pace of agricultural growth in order to reduce poverty by half under the first goal of the Millennium Development Goals (MDGs) by 2015. In this paper, we assess the expected effects of the CAADP on growth and poverty in Guinea-Bissau. Simulations are performed based on a dynamic general equilibrium model. The results reveal that Guinea Bissau would not achieve the first MDG goal by 2015 even under the assumption of an implementation of CAADP. Only a sustained implementation of CAADP on a longer time framework and a deliberate policy of increased agricultural productivity would allow policy makers to set the economy on a path of growth that will allow the halving of poverty by 2020.

Key words: Agriculture, growth, poverty, public investment.

INTRODUCTION

Like most countries that took part in the Millennium Summit in September 2000, Guinea-Bissau has pledged to move towards achieving the Millennium Development Goals (MDGs). Achieving the latter requires, first, to halve poverty by 2015. Indeed, with a GDP per capita estimated at EUR 210 per capita in 2002 and a Human Development Index which ranks at 166th out of 175 countries, Guinea-Bissau has a relatively high incidence of poverty (République de Guinée Bissau, 2004). The latter was estimated at 49% in 1991 and reached in 2002, nearly 65% among individuals. While the incidence of poverty was 52% in urban areas, it was around 69% in rural areas. While polarized rural poor, considering the composition of GDP certifies that, in contrast, agriculture is a relatively significant contribution. It represents nearly half of GDP. It is in this context that initiated the detailed program of development of agriculture in Africa (CAADP) which will be operationalized through the Farm Investment Program of Guinea-Bissau. The objective of this program which falls within the scope of the initiative African Union / NEPAD (AU / NEPAD) is to accelerate agricultural growth in order to reduce poverty. The CAADP whose declination in West Africa is the Common Agricultural Policy of the Economic Community of West Africa (ECOWAP) is a global platform of agricultural strategy. He urged all African states share the Maputo Declaration, which encourages them to increase their fiscal effort in the agricultural sector. If a consensus was reached on the need to ensure that policies or strategies for economic growth have a redistributive content, it should be noted, nonetheless, that it is not a sufficient condition to ensure poverty reduction (Mourji et al., 2006). Indeed, a good compromise between growth and income redistribution is essential for economies that have made it a goal to reduce poverty faster. A growth patern that exacerbates inequality is likely to negatively affect growth in turn. Also, a propensity to give priority to policies of redistribution can be detrimental to growth and thus limit the scope of these policies (UNDP, 2003).

Kuznets (1955) was one of the first authors that have highlight the relationship between growth and inequality by observing the relationship between the level of

JEL classification: O13, O47, I13, H57.

development of a country (measured in GDP / per capita) and its level of inequality. He argues that when a country develops, inequality increases at the first stages and then decrease. This relationship illustrated by Kuznets curve inverted U reflects the fact that initially a small share of the population benefits from economic growth. Indeed, economic growth in poor countries tend - at least initially - to increase income disparities between the rich and the poor, while in rich countries, growth diminishes these same disparities. In the early stages of development when investment in capital is the main mechanism of growth, inequality encourages growth by channeling resources towards those who save and invest more, while in more advanced economies, human capital takes over the physical capital as main source of growth.

However, relatively recent studies have shown that, contrary to the reverse causality between growth and inequality that Kuznets (1955) had established, inequality may vary cyclically, with the pay gap between skilled and unskilled labor. Most current observations show that inequality in wages and income has increased in OECD countries (Bourguignon and Morrison, 1992). The explanations tend to make the technical progress the most important source of inequality, given the episodic nature of changes in the level of inequality over the last 50 years. From a theoretical viewpoint, Piketty (2005) also calls into question the causality between the trend of the GDP per capita and income inequality suggested by the Kuznets curve. Indeed, in view of this relationship, one is tempted to believe that the increase in inequality over time in a country is a "natural" phenomenon that resolves itself over time endogenously. Yet, Piketty (2005) shows based on empirical data of the French and American economies that reducing inequality is not automatically associated with the growth of GDP per capita. It is primarily due to historically unexpected shocks that affect capital (war, inflation, natural disasters) or policies implemented (fiscal policy). The issue is however whether it is necessary to implement redistributive policies to reduce income inequality or expect that it solves itself with development process. According to Dollar and Kraay (2000), it is not necessary for governments to pursue pro-poor growth policies. One has just to put in place reforms that will lead to a macroeconomic framework conducive to growth. These authors studied a sample of 80 developed and developing countries and concluded that the average income of the poor has increased at the same rate as GDP per capita over the last four decades, generating earnings substantially identical in relative term for the poor and non poor. However, all the reforms and pro-growth policies are not necessarily pro-poor. Indeed, because of the heterogeneity in the income distribution, it is possible that a rapid economic growth contributes to a growth mechanism within which inequality is so high, that the positive impact of wealth creation is more than offset by the negative effect of increasing inequality (Bhagwati, 1988).

Generally, when shocks or policies induce economy wide effects, the use of an instrument of partial equilibrium analysis to assess them could overestimate the effects arising therefrom. Indeed, a partial equilibrium type specification requires extensive ties in income but does not take into account intersectoral linkages. In contrast, a complete specification of type EGC takes into account sectoral linkages in the economy and the feedback effects of the shock on the rest of the economy. Indeed, CGE models take into account the effect of shock on the sectoral supply and demand, on factor returns and income, and household consumption. Consequently, they lead to results substantially different and more accurate than the one obtained under a partial equilibrium framework. The researches on Guinea-Bissau's economy based on a general equilibrium framework are virtually nonexistent. Our research relies on a dynamic general equilibrium approach. The latter takes into account both the heterogeneity of households and the temporal dimension. The aim of this paper is to simulate the effects of the implementation of CAADP and alternative scenarios on the agricultural growth and poverty reduction. Subsequently, we take a brief look at agriculture in Guinea-Bissau and proceed to descriptive analysis of the economy. The model is then described and finally, simulations are performed and results are presented.

GDP STRUCTURE OF THE ECONOMY OF GUINEA-BISSAU AND POVERTY PROFILE

The implementation of investment program involves the definition of a coherent strategy for agricultural growth articulated to targets declined under the CAADP. One of the objectives expected from the implementation of the latter is a drastic reduction of poverty. Here, we first examine the structure of GDP and then look back over the poverty profile.

GDP structure

While looking to the structure of the GDP, it appears that agriculture accounts for nearly half of GDP. It is followed by tradable services whose weight in the GDP is also very significant Figure 1. The observation of the sectoral distribution of value added certifies that "trade and repair services of motor vehicles and household goods" (22.6%),"non-tradable services" (11.3%), "rice" (10.8%), "fishing" (10.2%) and "cashew"(8.5%) are sectors that contributes most to the GDP. Within the agricultural sector, rice (23%) and cashew (18%) are most important in terms of weight in the agricultural GDP (Table 1). Examination of the share of value added in agriculture certifies that this sector allocates almost 85% of its

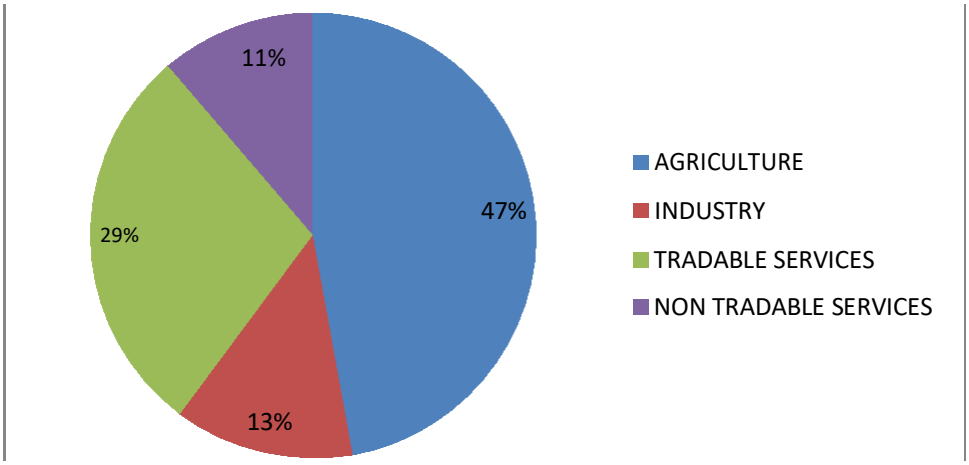

Figure 1. Share of major sectors in the GDP, 2007 (in %). Source: Author.

Table 1. Sectoral shares in GDP (in %), 2007.

Sectors	Initial share in the overall GDP in 2007	Initial share in the agricultural GDP in 2007
Agriculture		
Mil	3.10	6.58
Sorghum	1.90	3.97
Maize	2.80	5.92
Rice	10.80	22.99
Fonio	0.20	0.44
Cotton	1.10	2.25
Other type of agriculture	2.00	4.32
Cashew nuts	8.50	18.07
Livestock	4.30	9.17
Silviculture	2.20	4.61
Fishery	10.20	21.69
Industries		
Beverage and food	9.10	
Other industries	1.30	
Electricity, water and gaz	0.30	
Construction	2.30	
Tradable services		
Trade and repair	21.60	
Hotels and restaurants	1.10	
Transports and communication	4.00	
Financial services	0.50	
Real estate and other tradable services	1.50	
Non tradable services	11.30	

Source : Simulations.

production to factor income, and hence to households. However, the sectors of "food and beverage industries, "other industries", "water-electricity" and "transport and communication services" turn out to be the major

Table 2. Sectoral value added intensity.

Sector	Valeur ajoutée/Production (%)
Agriculture	84.9
Industry	49.4
Tradable services	66.9
Non tradable services	63.0

Source: Author.

consuming sectors of inputs and therefore, of relatively low value added. The analysis of the factor intensity of different sectors shows that agriculture is relatively more intensive in labor (skilled and unskilled) and in terms of agricultural capital Table 2. As for industry and tradable services, they use relatively more capital (Appendix 1).

Poverty profile

Analysis of expenditure patterns and household income are important to better understand the profile of poverty in Guinea-Bissau. Table 3 shows the different sources of household income. The remuneration of non agricultural capital and skilled labor represent about 40 and 36% of total income of urban households. Among rural, non-agricultural capital and unskilled labor have a relatively higher weight in their total income. The structure of basket consumption is marked by a predominance of agro-food items in rural area. Urban households consume relatively more industrial products. Tradable services also occupy a relatively significant in share in the urban basket consumption Table 4. Analysis of the poverty profile at the individual scale based on the household survey of 2002 (ILEAP) highlight a relatively high incidence of poverty at the national level. The rural area is the major zone of poverty (Table 5).

THE MODEL

We use a computable general equilibrium model to simulate dynamic effects expected from the implementation of the investment program designed as part of the Comprehensive Africa Agriculture Development Programme (CAADP) on the sectors, especially agriculture, allocation of factors and hence, their earnings and poverty. This type of model, more exhaustive, gives an overview of the channels of transmission of the effects of policies and / or external shock on the economy. It was designed to simulate the economic and social impacts of policy scenarios (external shocks, policy changes, changes in economic structure and socio-economic). The model used is an extension of the model Exter developed by Decaluwé et al. (2002). A set of features were added to the model: the inclusion of public capital, the introduction of a function of total factor productivity, the specification of a function of labor demand and the integration of an export demand function. The model is dynamic and recursive, meaning that it is solved as a sequence of static equilibria connected through time, through the accumulation of capital and increased labor and behavioral equations for endogenous variables. Its dynamics is based on the accumulation of capital and increased labor but also on endogenous savings behavior and investment of economic agents.

Some assumptions of an exogenous growth rate, however, are set for variables such as labor supply, government spending and transfers. One of the advantages of a dynamic model specification is the ability to generate a path in the medium and long term. In addition, structural changes can be analyzed over time. The model is applied to a small economy in which world prices are given. It includes 22 sectors: millet, sorghum, maize, rice, fonio, cotton, cashew nuts, livestock and hunting, forestry and forest, fishery, mining, food and beverages, other industries, electricity and water, construction, trade and repairs, hotels and restaurants, transport and communications, financial services, real estate and business services, non tradable services. The model includes eight factors of production: skilled and unskilled, agricultural capital, non-agricultural capital, public capital and three types of land that are land used for growing perennial cashews (Tac), the associated land used for growing rice (Triz) and the land used for other crops (Ta). These factors receive from sectors factor returns that are paid to different institutions. The model also includes five categories of institutions (urban households, rural households, firms, government and the rest of the world). In the explanatory model, we will focus on its specific features.

Specificities of the model

The value added is expressed differently across sectors. In non-agricultural tradable sectors (trna), value added (VA) is a CES function that combines a composite labor (LD) and a composite capital (KCF)

$$VA_{trna}{}^{t} = A_{trna}{}^{KLt}\left[\alpha_{trna}{}^{KL}\, LD_{trna}{}^{t\,-\rho_{trnKLa}} + \left(1-\alpha_{trna}{}^{KL}\right) KCF_{trna}{}^{t}{}_{\,-\rho_{trn}{}^{KL}{}_{a}}\right]^{-1/\rho_{trn}{}^{KL}{}_{a}}$$

In the agricultural tradable sectors (tra), value added (VA) is a CES function that combines land (LAND) and a composite factor (CF):

$$VA_{tra}{}^{t} = A_{tra}{}^{KLt}\left[\alpha_{tra}{}^{KL}\, LAND_{tra}{}^{t\,-\rho_{tra}{}^{KL}} + \left(1-\alpha_{traKL}\right) CF_{trat}{}^{-\rho_{tra}{}^{KL}}\right]^{-1/\rho_{tra}{}^{KL}}$$

The demand for agricultural land of each branch (tra) is determined by the the first order conditions of maximizing: The composite factor (CF) is a a CES function that combines a composite labour (LD) and a composite capital (KCF)

$$CF_{tra}{}^{t} = A_{tra}{}^{KLt}\left[\alpha_{tra}{}^{KL}\, LD_{tra}{}^{t\,-\rho_{tra}{}^{KL}} + \left(1-\alpha_{traKL}\right) KCF_{trat}{}^{-\rho_{tra}{}^{KL}}\right]^{-1/\rho_{tra}{}^{KL}}$$

Segmentation is introduced into the capital market in order to distinguish the farm capital (KDag) from the non-farm capital (KDnag). Each type of capital is mobile within each set of sectors (agricultural, non-agricultural), but there is no mobility between sets of sectors.Labor demand of each sector is determined by the first order condition of profit maximization for the tradable sectors:

Table 3. Structure of household income, 2007.

Household	Non skilled labour (%)	Skilled labour (%)	Non agricultural capital (%)	Agricultural capital (%)	Land of other agricultural sectors (%)	Rice land (%)	Cashew land (%)	Livestock land (%)	Forest land (%)	Firms (%)	Government (%)	Rest of the world (%)	Total (%)
Urban	10.20	38.20	42.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	9.30	100
Rural	26.40	15.30	33.10	14.20	1.80	1.30	0.70	0.40	0.20	2.70	0.20	3.80	100

Source: Calculations from the MCS.

Table 4. Structure of household expenditure, 2007.

Households	Urban (%)	Rural (%)
Direct taxes	2.0	0.3
Transfers paid	1.1	0.2
Savings	12.6	1.8
Consumption		
AGRICULTURE	34.3	67.5
INDUSTRY	42.7	28.5
TRADABLE SERVICES	7.4	1.8
Total	100	100

Source: Author.

Table 5. Poverty profile in 2007.

Area	Incidence (%)
National	64.71
Urban	51.56
Rural	69.3

Sources: Simulations.

$$LD_{tr}^{t} = \left(\frac{\alpha_{KL}}{1} \right)^{\sigma_{tr}^{KL}} \left(\frac{rc^{t}}{w^{t}} \right)^{\sigma_{tr}^{KL}}$$

$$KCF_{tr}^{t}$$

The composite capital (KCF) is shown as a Leontief function combining fixed share of sector specific public capital ($KDpub$) and private capital ($KDpriv$) that can be either agricultural or non-agricultural:

$$KCF_j^t = \min\left(\frac{KDpriv^t}{u\_k_j}, \frac{KDpub^t}{n\_k_j} \right)$$

In the non tradable sector, value added (VA^t_{ntr}) is a CES function that combines composite labor (LD^t_{ntr}) and public capital ($KDpub^t_{ntr}$):

$$VA_{ntr}^{t} = A_{ntr}\left[\alpha_{ntr}^{KLt}\left(KL_{LD_{ntr}}^{t}\right)^{-\rho_n^{KL}{}_{tr}} + (1-\alpha_{ntr}^{KL})KDpub_{ntr}^{t}\right]^{-1/\rho_n^{KL}{}_{tr}}$$

The demand for labor is determined by the first order condition of profit maximization:

$$LD_{ntr}^{t} = \left(\frac{\alpha_{ntr}^{KL}}{1-\alpha_{ntr}^{KL}}\right)^{\sigma_n^{KL}{}_{tr}} \left(\frac{ra^t}{w^t}\right)^{\sigma_n^{KL}{}_{tr}} KDpub_{ntr}^{t}$$

Factor productivity A is a function of the ratio between the total public capital and private capital sector $\left(\frac{\text{KDp ubG}^t}{\text{KDp riv}^t_{tr}}\right)$ and the sensitivity of productivity to this ratio. The aggregate stock of public capital (KDpubG^t) creates for each activity a positive externality that affects the total factor productivity in the sector. The productivity factor A will be so affected by the magnitude of externalities enjoyed by the sector and the elasticity of productivity to this argument:

$$A^t_{tr} = \overline{A}^t_{tr}\left[\left(\frac{\text{KDp ubG}^t}{\text{KDp riv}^t_{tr}}\right)^{\varepsilon_k}\right]$$

Dynamic model

The rule of private capital accumulation is determined as follows; its rate of accumulation is assumed to be an increasing function of cost-benefit ratio of capital, the latter moving at a decreasing rate:

$$\frac{IND^t_{tr}}{KD^t_{tr}} = f\left[\left(\frac{r^t_{tr}}{c^t_{tr}}\right)\right]$$

As for the flows of public investment by destination, they represent a fixed share of private investment flows by destination. This specification thus reflects the complementarity between these two types of investment in tradable sectors. In the non tradable sector, they depend on disposable income of the Government. The supply of unskilled labor and land supply grow at the same rate as population. However, the supply of skilled labor is assumed to grow at a slower pace than that of unskilled labor. Apart from these specifications, other equations specified in the model are standard.

Calibration and closure rules

The specification of the production, consumption and export demand functions require parameters, including: the income elastic-city of demand for products, the Frisch parameter, the elasticity of substitution between capital and labor, the elasticity of substitution between imported and local products, the elasticity of transformation between foreign sales and local sales, and the elasticity of foreign demand. In the absence of long series, these parameters were not estimated on data from Guinea-Bissau. They were taken from the literature of CGE models, and empirical studies in other similar developing economies. All other parameters were calibrated based on the data from the Sim to ensure consistency of data from the base year. In the closure of the model, the current account is assumed to be endogenous, which offers the possibility for the countries receiving capital inflows to finance domestic policies, especially the agricultural investment program which is the variation nationally in the Comprehensive Africa Agriculture Development Programme (CAADP).

This closure has been adopted, because the international community has pledged additional resources to countries that are developing a program of agricultural investment within the CAADP framework, if the public effort in favor of agriculture increased to reach 10% of public expenditures financed from own resources. The exchange rate, changes in inventories are also fixed. The savings rate is fixed from other institutions. Public spending is assumed to be fixed in real terms in the first period. However, it increases at the same pace as population. Public savings, transfers, labor supply, supply of land is also supposed to grow at the same rate as population. Therefore, these variables are set in the first period, as the minimum consumption.

Poverty computation

Changes in income and consumer prices could have different effects on households depending on their consumption basket and the profile of their income.The poverty analysis is conducted based on the FGT index of Foster et al. (1984):

$$P_{\alpha} = \frac{1}{n}\sum_{i=1}^{p}\left(\frac{z-y_i}{z}\right)^{\alpha}$$

where z is the poverty line, yi average expenditure of households i, α a coefficient expressing the level of aversion to poverty, n the total number of individuals, p the total number of poor in the population.

The poverty index is calculated based on the variable of interest "expenditure per adult equivalent". In the base year, the poverty threshold defined by the National Statistics Office (INEC) on the basis household survey of 2002 (ILEAP), is equal to two dollars defined in purchasing power parity of 1999, per day per person or 108 000 FCFA per person per year. A link is set between the model and the household survey that allow us to import the changes on consumer prices and income and compute poverty effects after each simulation. The new vectors of revenue and a new poverty line are therefore generated and the new poverty indexes calculated, so as to deduce the changes in poverty levels for different groups.

Table 6. Simulation of the level of productivity for the sectors of agriculture (in %).

Sectors	Initial level	CAADP		MDG1 in 2020	
		Final level	Mean rate of growth simulated (2007-2015)	Final level	Mean rate of growth simulated (2007-2020)
Millet	1.633	1.715	0.55	1.96	2.05
Sorghum	1.617	1.698	0.54	1.94	2.04
Maize	1.597	1.676	0.54	1.92	2.04
Rice	1.528	1.68	1.06	2.14	3.81
Fonio	1.744	1.918	1.06	2.44	3.81
Cotton	1.562	1.64	0.54	1.87	2.04
Other type of agriculture	1.633	1.715	0.55	1.96	2.05
Cashew nuts	1.415	1.486	0.55	1.70	2.05
Livestock	1.508	1.583	0.54	1.81	2.04
Silviculture	1.479	1.553	0.54	1.78	2.05
Fishery	1.678	1.762	0.54	2.01	2.04

Source: Simulations.

SIMULATIONS AND RESULTS

To assess the impact of the implementation of CAADP on economic growth, macroeconomic stability, and poverty, two scenarios were simulated. In a dynamic model, the economy grows, even in the absence of a shock. The business as usual scenario (BAU) provides information on the trajectory of the economy in the absence of a disturbance of past trends and therefore provides a reference scenario from which are assessed the deviations caused by external shocks or policy experiments. The BAU scenario will be used to assess the consequences of the implementation of CAADP on the economy of Guinea Bissau. We assume in the first simulation (SIM1) a 6% growth of agricultural GDP. This simulation performed tends to analyze the consequences of the implementation of CAADP, which is supposed to be based mainly on an increase in productivity. The observation of agricultural data on past yields in the period 2003 to 2007 shows that the largest increases are those of fonio crops, millet and rice. In the quest for agricultural growth of 6%, one should therefore take into account the possibilities associated with different agricultural crops.

Accordingly, crops that have a greater potential of performance in terms of productivity will support the highest increases in productivity. Moreover, improving the total factor productivity (TFP) is assumed to be accompanied by an increase in cultivated land in which rate of growth is supposed to double at least. Agricultural growth is therefore not only supported by an increase in TFP. It also relies on increasing the amount of land factor. Growth of 6% of agricultural GDP is obtained by means of increased productivity combined with an increase of 4.10% of cultivated areas. Table 6 provides information on increases in productivity culture that contributes to the achievement of the agricultural growth of 6%. Cereals such as rice, acha, millet, first, and livestock and cashew nuts are mainly sector that will bear the desired agricultural growth through the implementation of CAADP. In a second simulation (Sim2), a target of halving poverty by 2020 is set, according to the first MDG. This second simulation is performed under the assumption of a higher performance in terms of productivity. Indeed, a deep increase of productivity of the different crops is needed to achieve the goal of halving poverty.

Sim 1: Implementation of the CAADP *Impact on GDP*

The implementation of CAADP, has the effect of substantially raising the agricultural sector performance. Consequently, agricultural GDP would grow by 6.2%. Meanwhile, non-agricultural GDP progressed by 3.6%. This would induce an overall GDP growth of around 5.6% or a surge of 0.8% point increase compared to the reference scenario Figure 2. Increased productivity in the agricultural sectors as reflected in Table 7 leads to increased value added. In the primary sector, the largest increases are those recorded by the sectors of the cashew nuts, rice, sorghum and millet. Overall, value added grew in most sectors, except real estate, leasing activity, business services and non-tradable services (Appendix 2).

Impact on factor returns

The value added of the various sectors of the economy in general and agriculture in particular is increasing under the combined effect of an increase in the total factor productivity and quantities of factors used. Consequently, the average return on agricultural capital and non

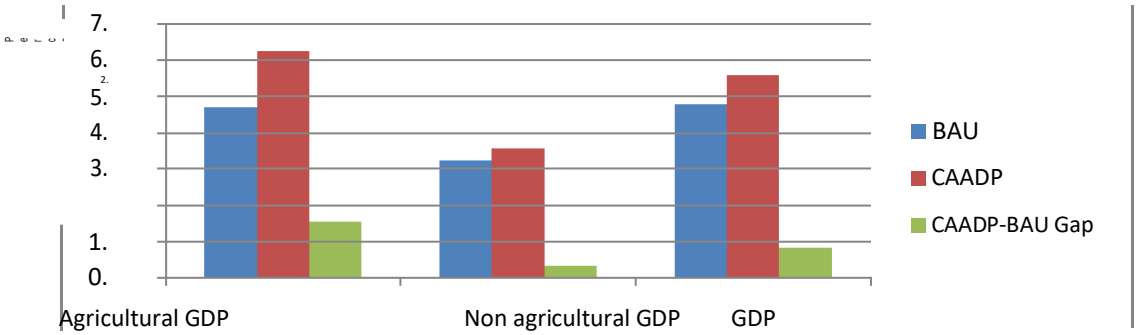

Figure 2. Average annual growth rate, 2007-2015 (in %) Sources: Author.

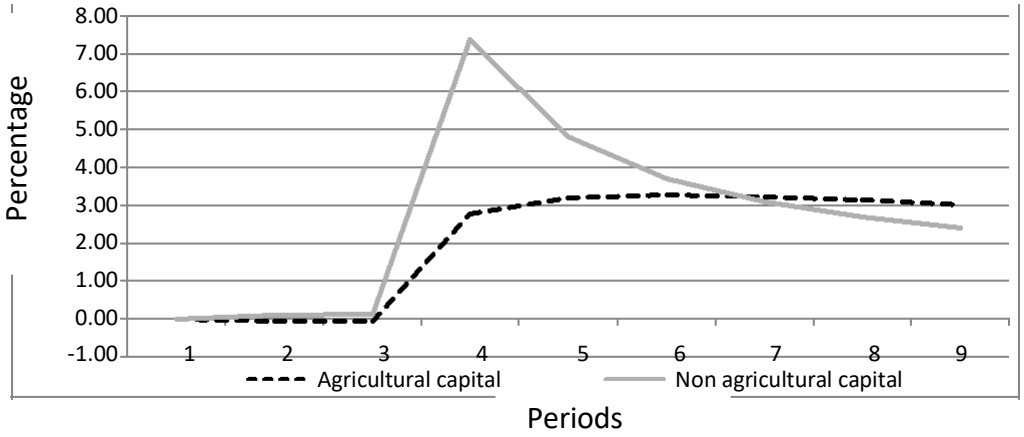

Figure 3. Changes in rate of return to capital, by type, (in %), 2007-2015. Source: Simulations.

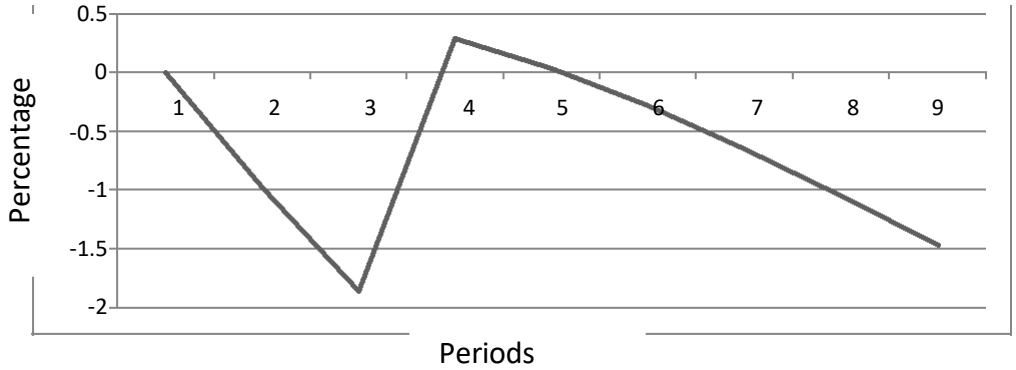

Figure 4. Changes in rate of return of land (in %), 2007-2015. Source: Simulations.

agricultural capital undergoes a relatively strong increase in amplitude during the first period after the implementation of CAADP. It then falls, reducing the average rate of return to non agricultural capital being greater than that associated with the agricultural capital, as a result of inter-sectoral links Figure 3. The rate of return to land decreases, first, in the years preceding the implementation of CAADP. It then increases with the implementation of the program and the pressure on land this program is supposed to induce. However, it decreases thereafter, owing to the higher demand areas Figure 4. However, wage rate increases, reflecting greater demand for unskilled labor, a factor used intensively in agriculture Figure 5.

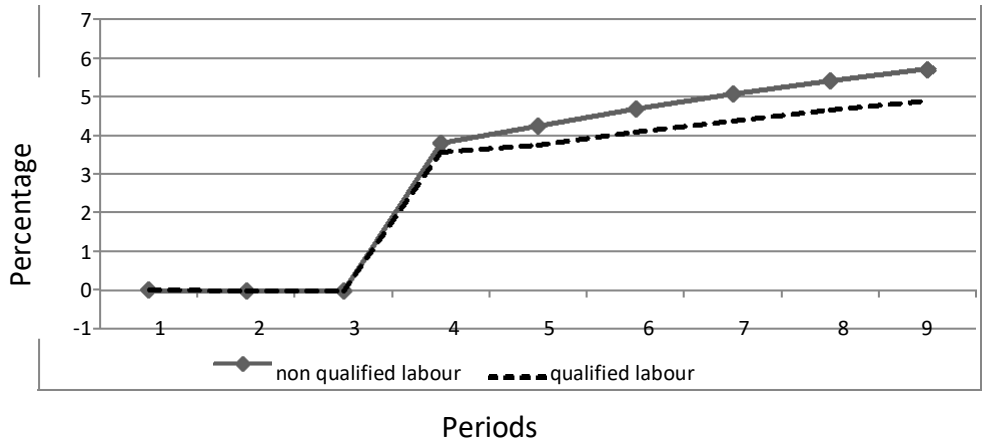

Figure 5. Changes in the wage rate (in %), 2007-2015. Sources: Simulations.

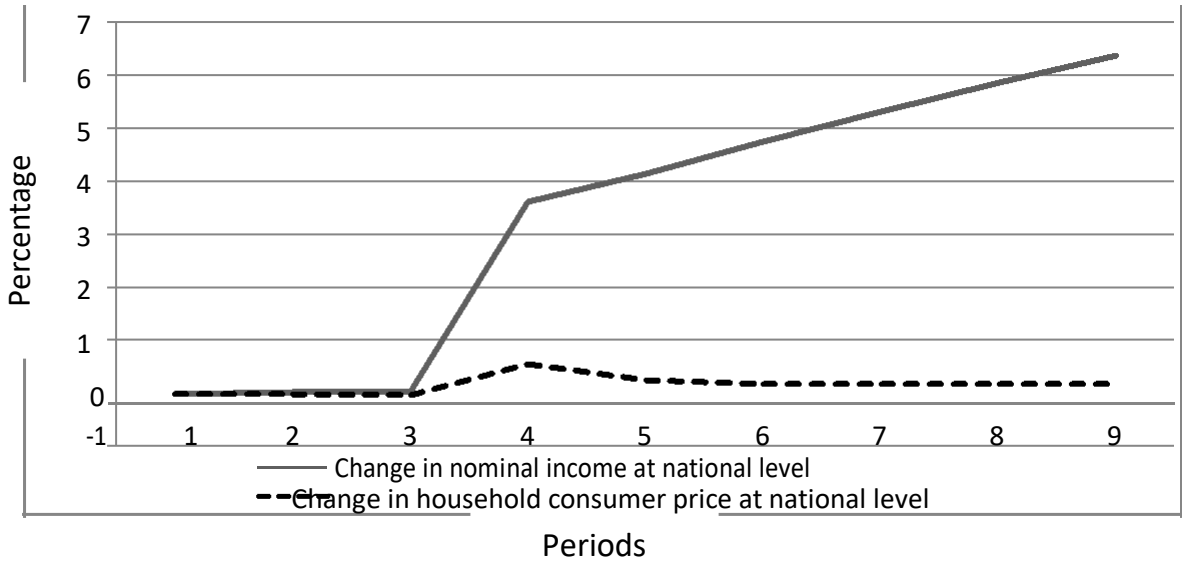

Figure 6. Changes in nominal income and consumer prices (in %), 2007-2015. Sources: Simulations.

Impact on nominal income and consumer prices

Changes in returns to factors that are redistributed to households affect their nominal incomes depending on their endowments. Also, households will be affected differently by the change in consumer prices, according to the structure of their basket consumption profile. Indeed, the price of consumer goods is an average price of import price and the price of domestic sales, weighted by their share in imports and domestic sales in the composite good. Changes in prices of goods and services consumed will affect the real consumption of households. The combined income and price effects will determine *a priori* the effects of agricultural investment program on poverty. The nominal income rises while consumer prices rose at the previous sub-periods and are stagnant over much of the period (Figure 6).

Effects on poverty reduction

The combined price and income effects give a poverty incidence level of 40.21%, at the individual level. This leads to a decrease of 6.65% of poverty rate compared to the reference scenario. If this rate allows a substantial reduction in poverty over the base year (2007) where the rate was 65%, it only just contribute to a relative decrease of 4.37% of the the incidence of poverty compared to its reference level for the MDGs which are assessed based on the year 1990. Indeed, the incidence of poverty was estimated at 49% in 1991 at national level

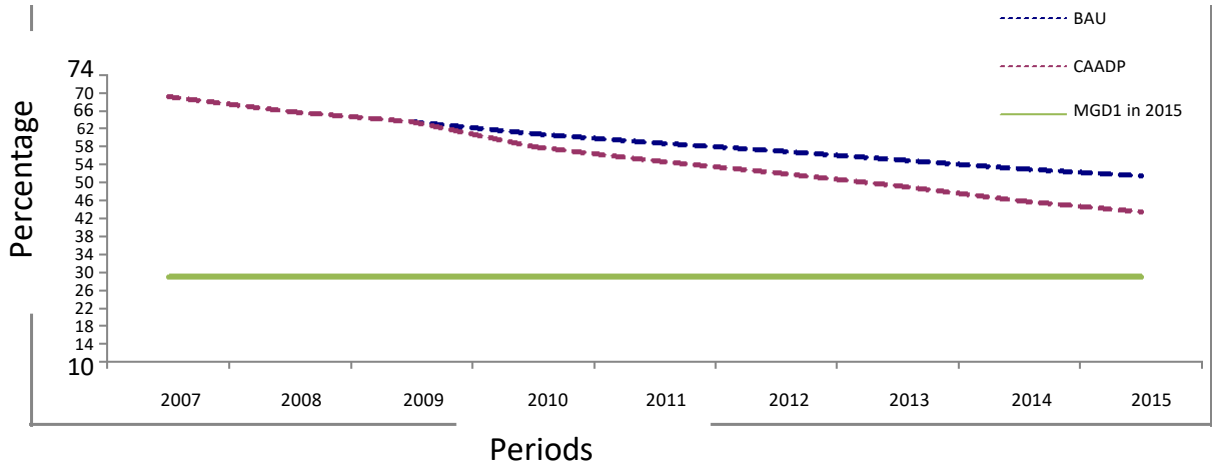

Figure 8. Trends in the incidence of poverty in rural areas (in %). Source: Author's calculations.

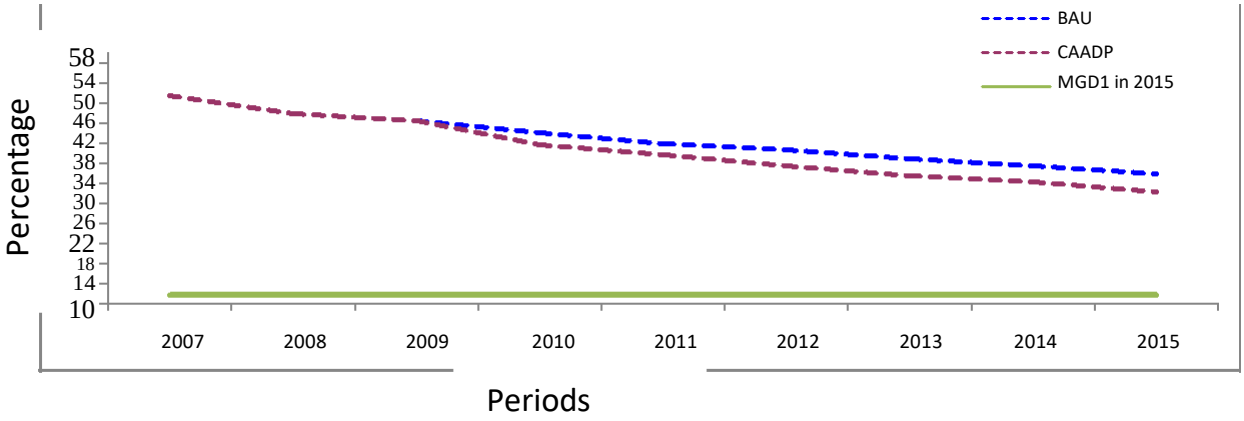

Figure 9. Trends in the incidence of poverty in urban areas (in %). Source: Author's calculations.

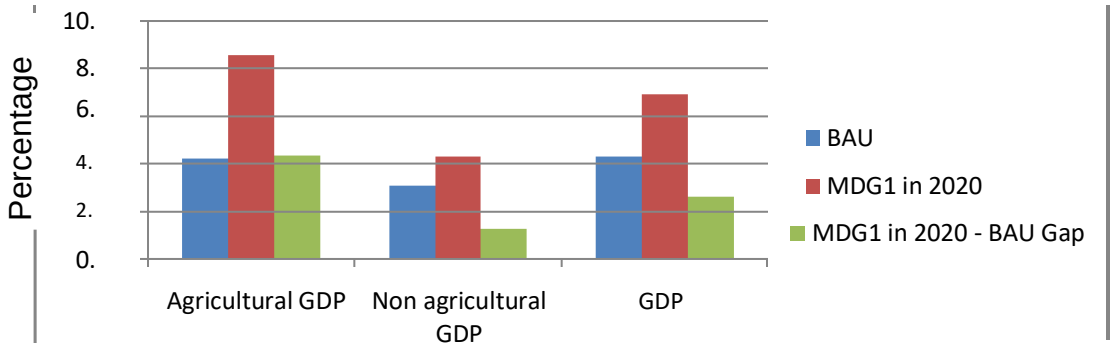

Figure 10. Average annual growth rate, 2007-2020 (in %). Source: Author's calculations.

while in urban and rural, it was respectively 24 and 58%. Consequently, despite this significant progress in the fight against poverty induced by the implementation of CAADP, Guinea Bissau will not be able to achieve the first stated aim of the MDGs which is to reduce poverty by half by 2015 (Figures 8, 9 and 10).

Sim 2: Achievement of MDG 1 in 2020

If MDG 1 cannot be achieved by 2015 through the implementation of CAADP in Guinea Bissau, revising the time framework coupled with an increase in efforts made by policy makers is therefore essential in achieving this

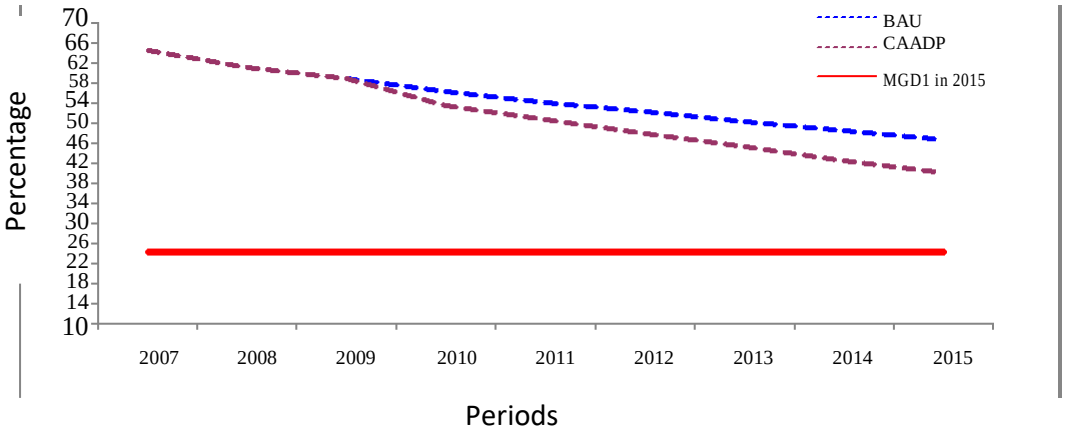

Figure 7. Trends in the incidence of poverty at national level (in %). Source: Author's calculations.

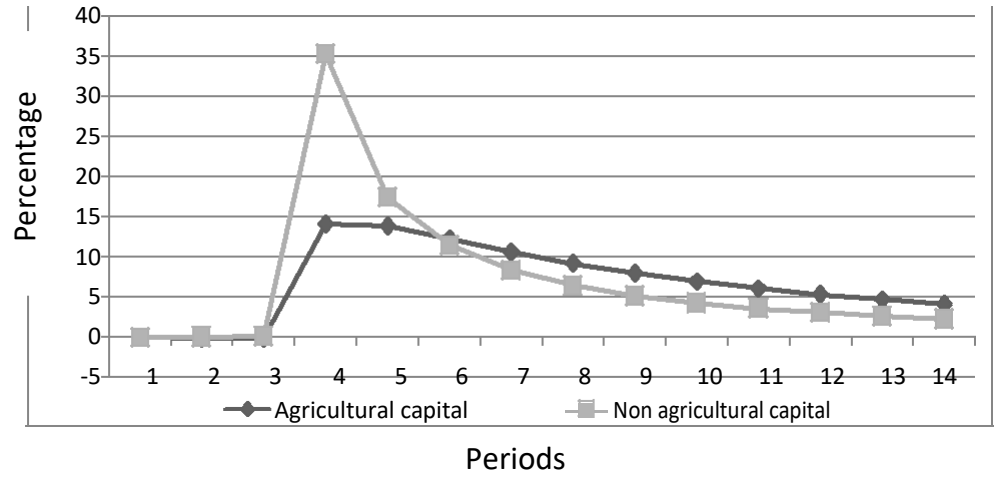

Figure 11. Changes in rate of return to capital (in percentage), 2007-2020. Source: Simulations.

goal. In a second simulation, we assume an increased productivity and a more large time framework of CAADP extended to 2020 as reflected in Figure 7

Impact on GDP

Agricultural GDP would then grow at an average rate of 8.6% between 2007 and 2020 compared to 4.2% if past trends are maintained (Figure 10). As for non-agricultural GDP, its growth rate would be about 4.3% (3.1% respectively under the assumption of a continuation of past trends). In total, overall GDP will grow at an average rate of 6.9% compared to 4.3%, if we assume a pursuit of the past trends. The additional growth gain provided by the program would be about 2.6% points with respect to the reference scenario Figure 10. The rise in productivity in the agricultural sectors will result in an increase in added value. Among those sectors, the largest increases are recorded by cashew nuts, rice, sorghum and millet. Overall, the value added is growing in all sectors.

Impact on factor returns

The average rate of return to agricultural and non agricultural capital follows the same trend as noted in the previous scenario Figure 11. The rate of return to land undergoes large amplitude fluctuations. After a relative decline that precedes the implementation of CAADP, it increases after the program, before decreasing again, while remaining positive. This pattern of returns to land is the result of a more ambitious target displayed in the production, in order to increase agricultural supply Figure 12. However, a greater pressure is exerted on the demand for unskilled labor. Accordingly, the wage rate for unskilled labor increases more than proportionally than the one of skilled labor Figure 13.

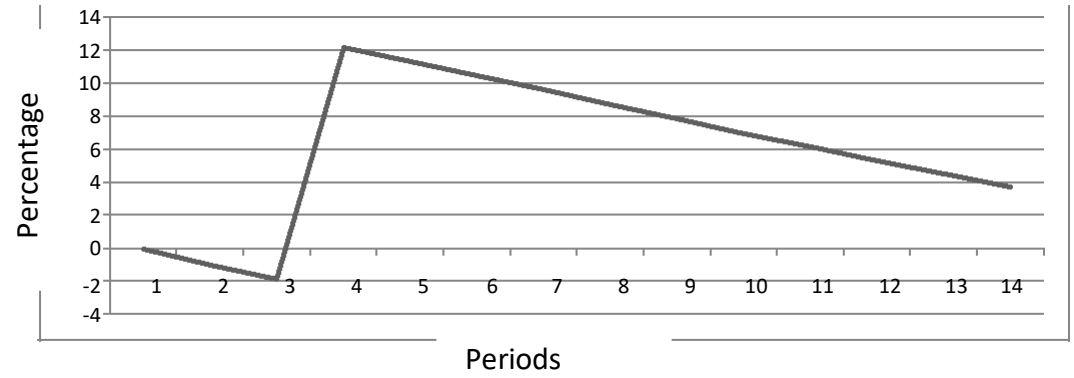

Figure 12. Change in rate of return to land (in %), 2007-2020. Source: Simulations.

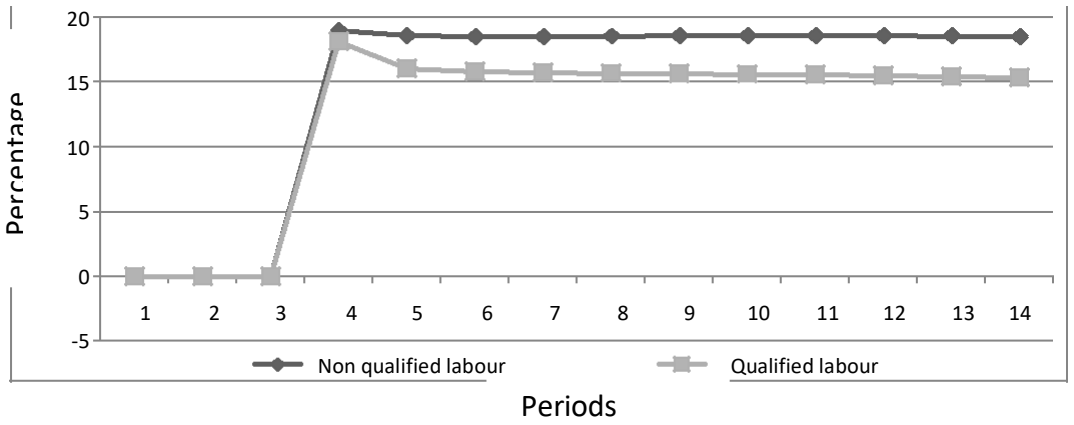

Figure 13. Changes in wage rate (in %), 2007-2020. Sources: Simulations.

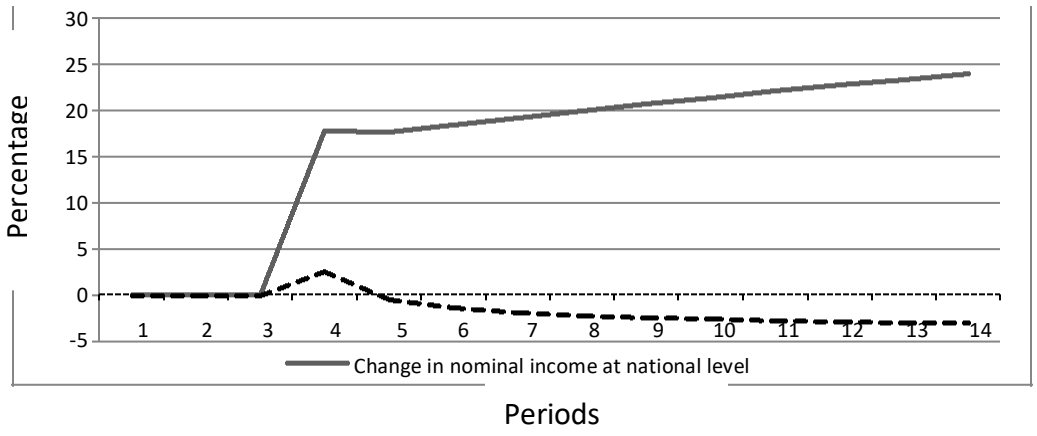

Figure 14. Changes in nominal income and consumer prices (in %) 2007-2020. Sources: Simulations.

Impact on nominal income and consumer prices

The nominal income rises while consumer prices increases, firstly before the implementation of the program and then decreases Figure 14.

Effects on poverty reduction

This scenario would imply a higher rythm of wealth creation and would be very conducive to the fight against poverty. The combination of price and income effects

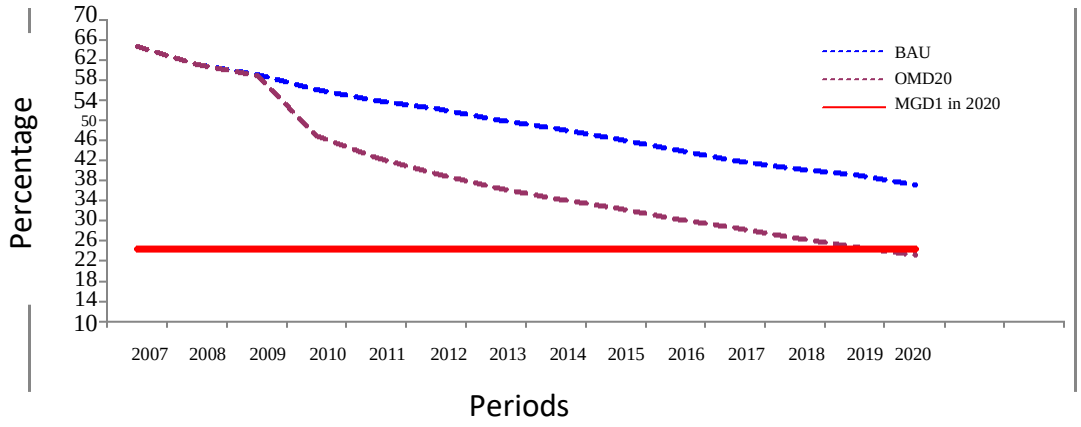

Figure 15. Trends in the incidence of poverty at national level according to the scenarios (in %). Source: Author's calculations.

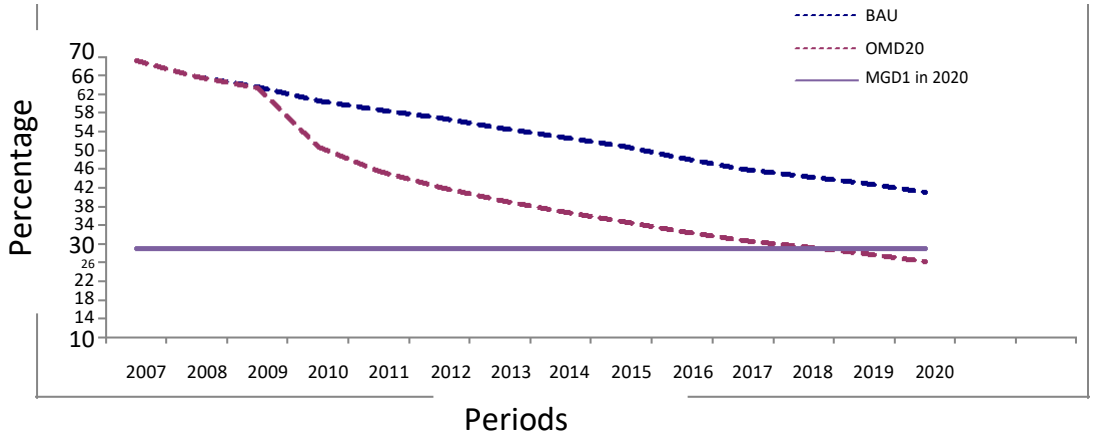

Figure 16. Trends in the incidence of poverty in rural areas (in %). Source: Author'scalculations.

translate into a poverty incidence of about 23.29% among individuals in 2020, allowing Guinea-Bissau to halve the poverty rate which was equal to 49% at the beginning of the 1990's. Accordingly, a strong improvement in productivity coupled with a longer implementation period would allow the CAADP Guinea-Bissau to halve poverty at the national level in 2020 (Figure 15). In rural areas, poverty is halved in accordance with the MDGs (Figure 16). In contrast, in urban areas, the objective of achieving the MDGs would still not be achieved given the relatively low level of poverty displayed by this group in the reference period and the weakness of inter-branch relations between the production sectors located in urban and rural areas in Guinea Bissau (Figure 17).

CONCLUSIONS AND POLICY LESSONS

Like other African countries, Guinea-Bissau is engaged in the formulation and implementation of CAADP which is an initiative of the African Union/NEPAD (AU/NEPAD) seeking to accelerate agricultural growth while contributing to poverty alleviation. In this research, we built a dynamic computable general equilibrium model, so as to simulate the effects of this program and those of some policy scenarios on agricultural growth and poverty Guinea-Bissau. The results highlight the following lessons:

i) The pursuit of the current trends as reflected in the BAU scenario, does not allow Guinea Bissau to halve the poverty incidence, estimated at 49% at the reference period of MDGs, even in twenty years;
ii) Guinea Bissau cannot achieve MDG 1 by 2015, even under the assumption of an implementation of the CAADP agenda given the enormous efforts, especially in terms of productivity that it should require within a relatively short time framework. This might be due to the adverse effect of inequality on poverty highlighted by Bagwati (1988), even if growth is boosted and tends to reduce poverty incidence;
iii) However, a sustained implementation of the CAADP

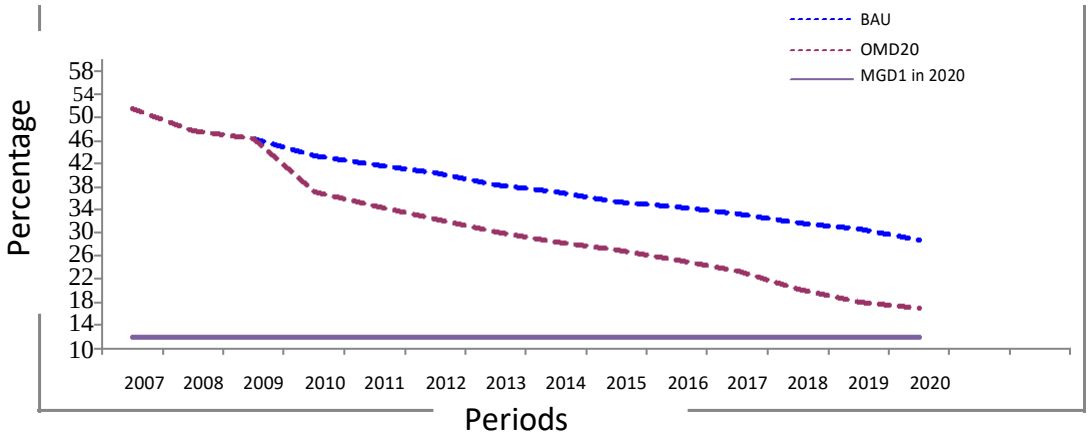

Figure 17. Trends in the incidence of poverty in urban areas (in %). Source: Author's calculations.

program over a more long time framework and deliberate policy of raising agricultural productivity would lead to the achievement of MDG 1 in 2020. As shown by Mourji et al. 2006), this pattern of growth will ensure a better compromise between growth and income distribution.

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Appendix 1. Factor intensity of different sectors and subsectors of the economy.

Sectors	LNQ (%)	LQ (%)	Capital non agri(%)	Capital agri(%)	Tag (%)	Tri (%)	Tac (%)	Tliv (%)	Tfor (%)	Total (%)
agriculture	26	25	0	44	2	1	1	0	0	100
industries	11	13	76	0	0	0	0	0	0	100
Services marchands	15	28	56	0	0	0	0	0	0	100
Services non-marchands	12	42	46	0	0	0	0	0	0	100
Mil	29	27	0	34	10	0	0	0	0	100
Sorgho	29	28	0	34	9	0	0	0	0	100
Mais	29	28	0	35	9	0	0	0	0	100
Riz	30	28	0	35	0	6	0	0	0	100
Fonio	27	26	0	32	15	0	0	0	0	100
Coton	30	28	0	35	7	0	0	0	0	100
Autres types d'agriculture	29	27	0	34	10	0	0	0	0	100
Noix de cajou	47	45	0	3	0	0	4	0	0	100
Elevage et chasse	15	14	67	0	0	0	5	5	0	100
Sylviculture et foret	29	27	44	0	0	0	0	0	5	100
Pêche	5	5	0	91	0	0	0	0	0	100
Industries extractives	60	37	3	0	0	0	0	0	0	100
Produits alimentaires et boissons	12	8	80	0	0	0	0	0	0	100
Autres industries	4	16	80	0	0	0	0	0	0	100
Electricite et eau	4	16	80	0	0	0	0	0	0	100
Travaux de construction	8	32	60	0	0	0	0	0	0	100
Commerce et reparations	14	30	56	0	0	0	0	0	0	100
Hotels et restaurants	19	25	56	0	0	0	0	0	0	100
Transports et communications	18	23	59	0	0	0	0	0	0	100
Services financiers	4	40	56	0	0	0	0	0	0	100
Immobiliers et services aux entreprises	31	13	56	0	0	0	0	0	0	100
Services non-marchands	12	42	46	0	0	0	0	0	0	100

Source: Author.

Appendix 2. Cumulative change in value added (in %), 2007-2015.

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Mil	0	0.14	0.31	6.00	7.30	8.73	10.21	11.71	13.23
Sorgho	0	0.14	0.30	6.15	7.50	8.98	10.49	12.03	13.59
Maïs	0	0.14	0.30	9.96	12.20	14.47	16.68	18.85	20.97
Riz	0	0.10	0.22	12.54	14.63	16.70	18.71	20.65	22.53
Fonio	0	0.16	0.35	24.78	28.70	32.38	35.80	39.02	42.08
Coton	0	0.08	0.18	3.60	4.37	5.15	5.93	6.72	7.52
Autres types d'agriculture	0	0.12	0.27	8.19	10.03	11.78	13.44	15.04	16.58
Caju	0	0.14	0.32	14.53	19.29	23.63	27.87	32.06	36.20
Élevage	0	0.09	0.21	8.55	9.93	11.53	13.12	14.66	16.16
Silviculture	0	0.06	0.14	5.95	7.12	8.27	9.35	10.37	11.35
Pêche	0	0.02	0.07	7.90	10.23	12.68	14.86	16.86	18.72
Alimentation et boissons	0	0.02	0.06	0.90	2.99	4.49	5.70	6.77	7.75
Autres industries	0	0.00	0.07	0.13	3.86	5.14	6.17	7.12	8.04
Electricité et eau	0	0.01	0.03	-0.25	0.67	1.09	1.40	1.68	1.93
Construction	0	0.10	0.16	7.57	6.74	6.84	7.06	7.33	7.62
Commerce, services de reparations	0	0.00	0.01	0.22	0.46	0.62	0.76	0.89	1.00
Hotels et restaurants	0	0.03	0.08	-0.11	0.91	1.48	1.95	2.39	2.83

Appendix 2. Contd.

Transport et communications	0	0.02	0.05	1.40	2.21	2.81	3.33	3.82	4.28
Services financiers	0	0.01	0.03	0.92	1.57	2.05	2.49	2.90	3.30
Immobilier, ALUGUERES et services aux entreprises	0	0.01	0.04	-3.43	-3.01	-3.11	-3.31	-3.54	-3.77
Services non-marchands	0	0.00	0.00	-3.14	-3.07	-3.36	-3.71	-4.05	-4.38

Source : simulations.