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Policy Brief

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Revival of Agricultural Productivity in Africa: Hoping for Better Food Security

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Summary

In comparison to previous decades, remarkable economic performance accompanied the entry of African economies into the new millennium. The agricultural sector, which remains the cornerstone of economic and social development, has not remained on the sidelines. Overall, this sector continues to show robust growth, driven by an increase in productivity, measured in part and overall terms. However, lower-level results point to serious disparities and a need to strengthen progress towards achieving development goals. Unlike developed countries, agricultural growth on the continent remains primarily dependent on the increase in the use of primary factors, combined with a stagnation of the use of inputs. All this once again gives rise to the need to invest more in bringing about conditions that favor the emergence of productivity.

1. Traditional issues

After the era of structural adjustment programs of the 1980s and 1990s, the economic literature seems to have regained interest in the role of the agricultural sector in economic and social development, poverty alleviation, and food insecurity in developing countries. This interest has been reinforced with the international community's determination to combat poverty and vulnerability, as reflected in the Millennium Goals. It has increased since the last food crisis of 2007-2010, which once again highlighted the vulnerability of many developing countries and the limits of international market-based strategies in ensuring the food security of those countries.

In Africa, which is the continent most often characterized by its wealth of natural resources and the poverty of its populations, this renewed interest in the agricultural sector has been twofold. On the one hand, although the continent has recorded relatively high growth rates over the past two decades compared to other regions of the world, this has not led to a significant reduction in the incidence of extreme poverty and food insecurity. According to the World Bank (2016), it would seem that overall, growth does not lead to a reduction in poverty in Africa as much as it does elsewhere in the world. Similarly, despite the important agricultural potential, the continent is increasingly dependent on the international market to meet the basic food needs of its population. On the other hand, agriculture continues to play an important role in the economies of the majority of African countries, particularly in terms of their contribution to GDP, employment and trade.

In terms of poverty, if it appears to have declined in relative terms, from 57% in 1990 to 43% in 2012, the population living below the poverty line has increased by 31% in absolute terms. The incidence of extreme poverty has remained high, particularly in sub-Saharan Africa. In this part of the continent, according to United Nations data, nearly 400 million people, or 45% of the population, continue to live below the threshold of the equivalent of $1.9 dollars in purchasing power parity per day. Closely linked to poverty, food insecurity, in terms of availability, accessibility, stability and quality of food intake, remains a concern in a large number of countries. The prevalence

of undernourishment in Africa has gone from 28% during the 1990-1992 period to 20% during the 2014-2016 period (FAO, 2015). Like the poverty rate, this decline in relative terms of undernourishment conceals a larger incidence of this problem, since in absolute terms the number of undernourished people has increased from over 181 million during 1990-1992 to more than 232 million people.

2. Agriculture, the cornerstone of economic and social development

Indeed, it is estimated that agriculture's direct contribution to GDP in Africa was about 15% in 2013. It should be noted that this contribution can reach very high proportions in many countries (see Table 1), as is the case, for example, in Liberia, where it amounts to almost 65% of GDP. If indirect effects of upstream and downstream training were added to this direct contribution, agriculture's overall contribution to the economy would be between 40% and 50% of GDP.

The importance of agriculture in African economies is also reflected in the sector's share of employment and exports. According to data from the African Development Bank, in 2014 the active population employed in agriculture in Africa was around 54% of the total employed population. Evaluated by region, this average was 24% in North Africa, 46% in West Africa, 52% in Central Africa, 53% in Southern Africa and 77% in Eastern Africa. On the trade side, in 36% of these countries, agricultural exports accounted for more than a quarter of total exports in 2013. It is clear that for some countries, agricultural exports account for the bulk of total exports. This is the case, for example, of Ethiopia and Guinea Bissau, where agricultural exports account for 83% and 93% of total exports, respectively.

Considering the importance of the agricultural sector, many analysts agree that agriculture must be the cornerstone of economic and social development in Africa: agriculture-led development. In the economic literature, two currents can be distinguished. The first advocates the development of small-scale agriculture to ensure food security at the national level and at the rural household level.

Table 1: Share of agriculture in GDP and exports in 2013

Country	% GDP	% exports
Algeria	10	1
Angola	9	0
Benin	33	26
Botswana	2	3
Cameroon	21	25
Burundi	36	56
Burkina Faso	32	35
Cape Verde	8	2
Central African Rep.	39	13
Chad	18	2
Comoros	44	87
Congo	4	0
Egypt	14	17
Eritrea	17	2
Equatorial Guinea	1	0
Ethiopia	42	83
Gabon	4	1
Gambia	22	25
Dem. Rep. of the Congo	19	1
Djibouti	3	40
Ghana	21	16
Liberia	65	31
Guinea	23	8
Guinea-Bissau	45	93
Ivory Coast	27	41
Kenya	27	53
Lesotho	7	3
Libya	2	0
Madagascar	24	19
Malawi	30	78
Mali	34	36
Mauritania	20	1
Mauritius	3	15
Morocco	15	11
Mozambique	27	17
Namibia	7	13
Niger	37	7
Nigeria	21	1
Rwanda	33	37
São Tomé and Príncipe	21	34
Senegal	14	24
Seychelles	3	1
Sierra Leone	48	7
Somalia	53	90
Soudan	42	14
South Africa	2	10
South Sudan	4	
Swaziland	6	27
Togo	39	17
Tunisia	8	9
Uganda	25	55
United Rep. of Tanzania	31	27
Zambia	18	12
Zimbabwe	10	35

Data source: UNSTATS, FAOSTATS

The second trend emphasizes the role of agriculture in the early stages of development and structural transformation of the economy. In order to achieve its potential role, the sector must improve productivity resulting in the release of an economic and labor surplus for the development of other sectors considered more valuable in terms of capital and labor resources, especially industry.

On the whole, renewed interest in agricultural development has resulted in the adoption and implementation of policies aimed at developing this sector. The Comprehensive Africa Agriculture Development Programme (CAADP) of the New Partnership for Africa's Development (NEPAD), the various regional agricultural policies and national agricultural investment programs are tangible examples. The question now is whether these policies translate into growth in the sector and, if so, what is the quality of this growth? Is it the result of a simple expansion or intensification, or both at the same time, and / or an improvement in total factor productivity (TFP)?

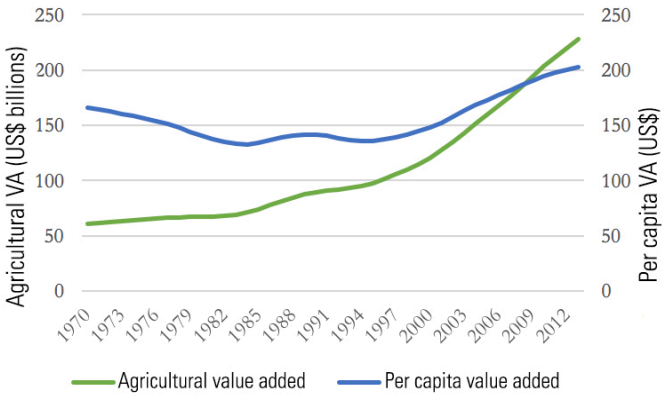
In this context, this article focuses on characterizing the agricultural growth observed in recent decades in Africa, by explaining the extent to which this growth has been stimulated by technological improvement. Thus, is it part of an economic transition dynamic that could ultimately lead to structural economic transformation, or is it simply an exacerbation of the tendencies to expand cultivated land and to intensify labor in this sector? A TFP analysis is the main tool for this evaluation.

3. Agricultural growth and the use of resources

3.1. Growth and use of land and labor factors

A rapid analysis of agricultural growth in Africa over the last five decades shows that it has generally been positive. However, changes in its overall and per capita levels make it possible to distinguish three phases of change (see figure 1). The former covers the period prior to the mid-1980s and is characterized by low growth. The second, from the mid-1980s to the late 1990s, is characterized by relatively higher growth but insufficient to compensate for the rapid population growth. The third, beginning in 2000, is characterized by growth that was sufficient to compensate for population growth and enable per capita agricultural growth.

Figure 1: Total agricultural value added and per capita in Africa



Data source: United Nations Statistics Division

The first phase broadly corresponds to the post-independence period, characterized in most African countries by state intervention in the sector and in the agricultural and agri-food markets in general. The low agricultural growth observed during this first phase resulted in agriculture's reduced contribution to the economy, which fell from nearly 17% on average in 1970 to almost 13% in 1985, a drop in per capita agricultural value added and a deterioration of food security in a large number of African countries. In terms of use of production factors, this period is characterized by an intensification of labor in agriculture, as evidenced by the high growth rate of the active labor force employed in the sector, which averaged 2%, while the amount of land cultivated stagnated (see Figure 2). Overall, African agriculture during this period has absorbed much of the labor force growth, at the cost of low labor productivity and low incomes in rural areas. This was only a direct consequence of the weak development of other sectors of the economy.

The second phase spans from the mid-1980s to the end of the 1990s and corresponds to the period of deep economic reforms in most African countries, known as structural adjustment programs. During this phase, these countries were called upon to reduce state intervention in the economy, liberalize markets and significantly realign their exchange rate policy. As far as agriculture is concerned, these reforms have enabled agricultural growth to resume in the majority of countries. This growth has increased from 0.8% on average per year between 1970-1984 to 2.7% in 1985-1999. However, while this growth in agriculture has prevented further deterioration in food security in many African countries, it has only been sufficient to offset the high population growth since per capita agricultural production has remained constant throughout the period.

«In most African countries economic growth, and in particular growth in the agricultural sector, began to surpass population growth.»

Growth in agriculture during this second period (2.7% per year on average) appears to have been achieved only through greater use of resources, notably labor and land. In a context of very low investment in agriculture, this did not translate into a significant improvement in the productivity of these two factors.

Figure 2 : Croissance la valeur ajoutée agricole, du travail et de la terre

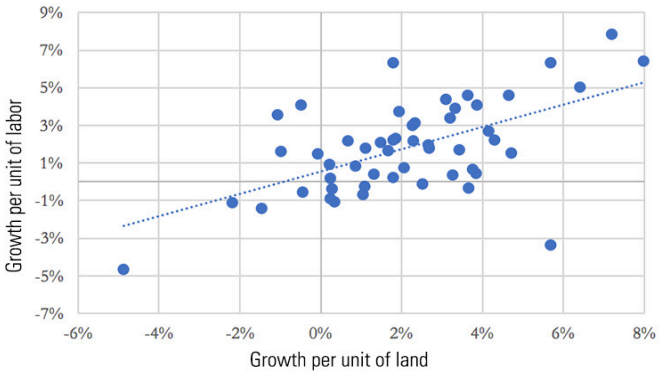
Source de données : FAOSTAT, UNSTATS, USDA

The third phase covers the post-structural adjustment period. During this third phase it can be said that the drastic economic reforms that African economies experienced during the 1980s and 1990s began to produce their effects since in most African countries economic growth, and in particular growth in the agricultural sector, began to surpass population growth. Moreover, agriculture has asserted itself as the engine of economic growth in many African countries, and the trend towards a decline in its contribution to the economy has reversed. Indeed, agriculture's share of GDP rose from its low levels reached in the mid-1980s, from about 13% to nearly 15% on average.

Overall, during this third phase, agricultural growth averaged 5.2% between 2000 and 2013, significantly exceeding the expansion rate of cultivated areas and the rate of increase of the active population employed in the sector. During the same period, the average annual growth rates were 1.3% and 2.2%, respectively. As a result, for the first time, growth in African agriculture exceeded population growth, reaching an average per capita annual growth rate of 2.6%.

In detail, an analysis covering 52 countries reveals that 44 countries achieved positive average agricultural growth between 2000 and 2013. Of these 44 countries, 31 countries were able to achieve agricultural growth higher than population growth, enabling positive per capita agricultural growth. Similarly, 37 countries registered positive agricultural growth both per cultivated hectare and per agricultural worker (see Figure 3).

Figure 3: Agricultural growth per unit of labor and land between 2000 and 2013



Data source: FAOSTATS, UNSTATS, USDA

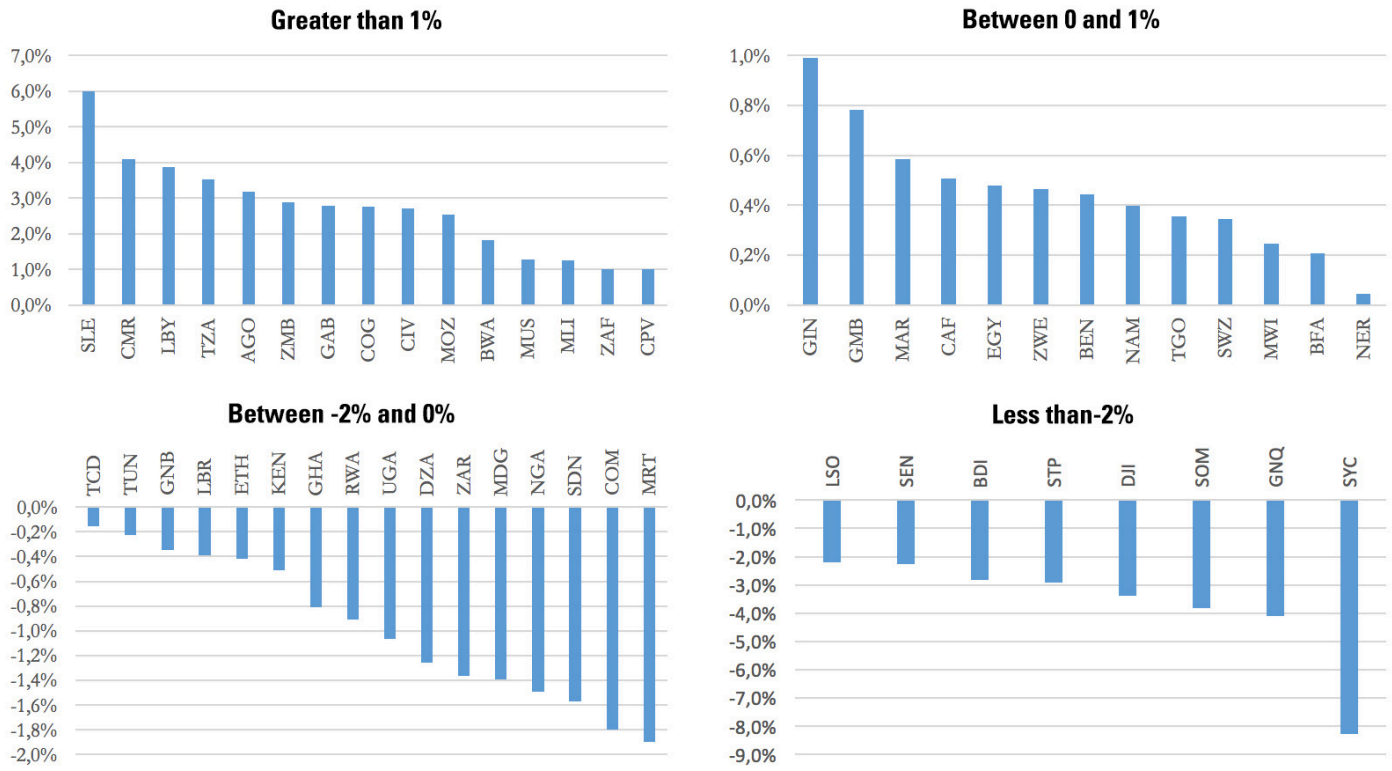
In the 15 other countries, either a decline in value added per unit of area under cultivation or a decrease in value added per unit of labor, or both, is observed. In other words, these trends indicate that in almost 30% of African countries, agricultural performance is far from achieving the development objectives.

In the other seven countries this growth was only possible through a more than proportional increase in land and labor factors, meaning, at the expense of a lower productivity of these two factors.

Growth at the continental level is thus the product of many disparities. In countries where negative agricultural growth rates are observed per unit of labor (decline in labor productivity), the standard of living deteriorates, which increases poverty, particularly in rural areas. In these countries, it can be argued that in the absence of the significant development of other sectors, and in the absence of structural economic transformation, the agricultural sector remains a safe haven for an increasingly large and unskilled workforce. This decline in the standard of living of rural populations is generally accompanied by the abuse of natural resources, particularly by expanding crop production to marginal areas and fragile lands.

Overall, during this third period, on average, there was a decrease in the area cultivated per worker indicating

Figure 4: Growth of land per worker between 2000 and 2013



Source : données USDA. Calculs des auteurs

that the improvement of labor productivity based on the expansion of cultivated areas has reached its limits in a large number of countries. On average, the growth rate of the area cultivated per worker was -0.85% during the 2000-2013 period. This rate was positive only in half of the countries (26 out of 52 countries, see Figure 4). In the remaining 26, any increase in agricultural productivity can only be achieved through improved total factor productivity, greater use of inputs and capital intensification.

3.2. Level of use of inputs and capital

In terms of inputs and capital, it is striking to see how little progress has been made, whereas during the 2000s, African agriculture seemed to receive relatively more attention from international organizations. For example, average fertilizer consumption in Africa has barely exceeded 18 kg of fertilizer units (N, P2O5 and K2O, all combined) per hectare in 2012. This level remains well below the required use to conserve soil fertility and far from the level of consumption that will ensure increased production. By comparison, in the rest of the world and during the same year, this consumption was on average seven times higher, ie nearly 130 kg / ha. This situation does not seem to be improving since between 2000 and 2012, the annual growth rate of fertilizer consumption in Africa was only 0.44% on average, while in the rest of the world it was 2.18% on average.

«Trends in the level of total factor productivity in the agricultural sector in Africa since the independence period so far show two major periods. »

From the point of view of investment in agriculture, the same observation can be made as indicated by the levels of mechanization and equipment of land for irrigation, both of which are essential for risk mitigation and improving agricultural productivity. In 2012, the number of agricultural machinery used in Africa was 1.8 per thousand hectares, while in the rest of the world this number was 18 times greater, i.e. 31.9 per thousand hectares. In terms of growth rates, the number of machines even declined slightly between 2000 and 2012, while in the rest of the world, and during the same period, this number increased by 24%, representing annual growth of 1.9%.

Similarly, investment in irrigation in Africa has remained very limited overall. While in the rest of the world, the area equipped for irrigation reached almost 23% of the cultivated land in 2013, it accounted for only 5.6% in

Africa during the same year. Moreover, nearly 62% of these irrigated areas are concentrated in northern Africa, i.e. an irrigation rate of 20%, while sub-Saharan Africa, which represents over 82% of the cultivated area, only represents nearly 38% of irrigated areas, i.e. an irrigation rate of only 2.6%.

In summary, it can be said that the increase in the use of land and labor resources seems to have been the dominant factor in agricultural growth. It can also be argued that the intensification of agriculture, by using more inputs and by increasing the capital stock, has remained limited in Africa, as evidenced by the low levels of consumption of fertilizers and insufficient investment in irrigation and mechanization. This suggests that the only justification for this difference between growth in the sector and the growth in the use of factors can only come from an improvement in total factor productivity, which also reflects technological change in production.

4. Growth of total factor productivity

The concept of total factor productivity (TFP) refers to the relationship between production and all the factors used in production (capital, labor, land and intermediate consumption). Improving agricultural TFP not only contributes to agricultural growth but it is also crucial for improving the competitiveness of the sector, reducing poverty and food insecurity. Indeed, it reports on the performance resulting from the use of all the inputs entering the production system.

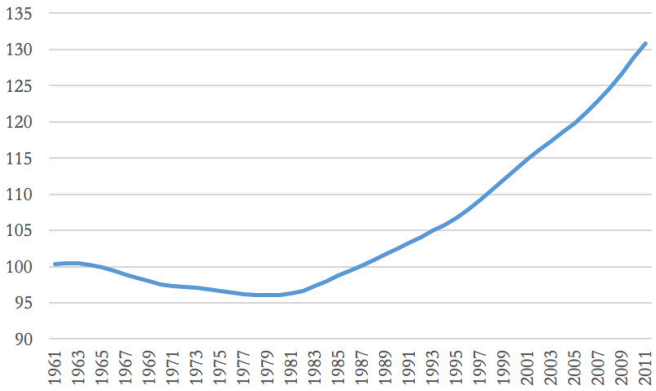
This builds the growing interest of the scientific community and decision-makers in examining the evolution of this crucial component of agricultural growth. The study underlying this article (Guèdègbé, 2015) used the method known as Growth Accounting. It consists of breaking down the observed growth in production from the various production factors as well as the growth in total factor productivity. It then makes it possible to assess the contribution of these various components to growth. Two approaches were used to conduct this evaluation. The first considers only the primary factors of production (natural capital, manufactured capital, and labor), and therefore focuses only on the growth of value added. Thus, this first approach only adopts the viewpoint of economic growth and neglects the overall growth of agricultural production. The agricultural production may be in the early stages of development within a legitimate objective of a country's economic policy in view of its multiplier effects on the rest of the economy or its impact on food security. The second approach takes account of both primary and intermediate factors and therefore focuses on the growth of total agricultural production but does not reflect the sector's contribution to overall economic growth.

«20 countries had positive TFP growth rates during both periods. »

Regardless of the approach, TFP also incorporates contributions from all factors other than measurable physical factors. This includes technological and institutional changes, improvements in efficiency and resource allocation, and changes in the quality of factors and inputs incorporated into production processes. The assessment of this TFP remains dependent on how the physical factors, primary factors and intermediate consumption are quantified. Particular attention has been paid to quantifying the land factor.

Observing the results of trends in the level of total factor productivity in the agricultural sector in Africa since the independence period so far shows two major periods of its evolution (see Figure 5) that are largely found at the national level. In the first period, from the early 1960s to the mid-1980s, among the 49 countries that could be studied, the TFP level on average slightly decreased (growth rate -0,2%). This decline in TFP negatively impacted agricultural growth, which was mainly driven by strong growth in land and labor utilization. The second period extends from the mid-1980s to present. On average, there is an increase in the level of TFP (growth rate of 1.1%), but as always, with diverse situations from country to country.

Figure 5: Trends in total factor productivity in agriculture in Africa (1961 = 100)



Source : (Guèdègbé, 2015)

A country-by-country analysis indicates that 20 countries had positive TFP growth rates during both periods. In 20 other countries, it appears that structural adjustments

have enabled positive growth in TFP in the second period, whereas it was negative in the first period. In the remaining nine countries, TFP growth was negative in the second period. In 4 of these 9 countries, TFP growth was on average positive in the first period, unlike the 5 remaining countries in which it was negative in both periods.

« Agricultural growth in sub-Saharan Africa has been mainly achieved through increased utilization of production factors, specifically labor and land. »

Several countries have therefore evolved towards an increase in their overall factor productivity. But in many of these countries this growth has not been sufficient to be considered as a major driver of growth in the sector. Of the forty countries with TFP growth in the second period, 39 showed a positive average growth in agricultural production (see Figure 6). Of these 39 countries, 7 had a growth in TFP contribution to growth in production between 0 and 25%, 13 others between 25% and 50%, 13 others between 50% and 75%, 3 between 75% and 100%, and 3 others recorded higher TFP growth than growth in production and thus a contribution of more than 100%. In developed countries, TFP is the main driver of agricultural growth, with a contribution generally exceeding 100% (South Africa: 164%, Spain: 153%, USA: 120%).

This increase in agricultural productivity would be enhanced if accompanied by substantial development in other sectors. In other words, the structural transformation in Africa has been insufficient to generate a real increase in productivity in the economy as a whole and in particular in the agricultural sector.

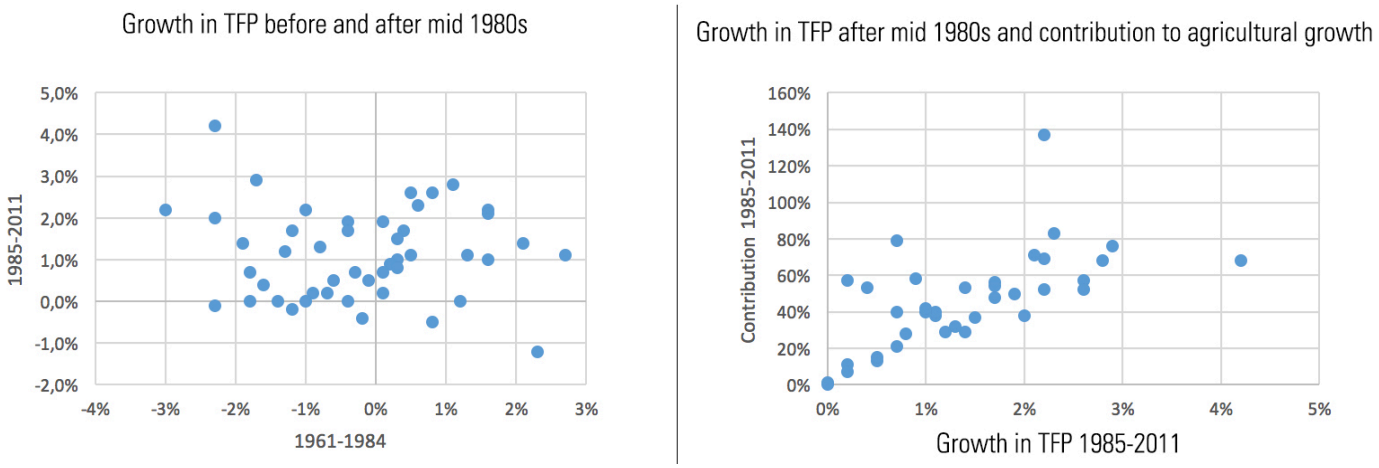
5. Conditions for emerging productivity

Overall, agricultural growth in sub-Saharan Africa has been mainly achieved through increased utilization of production factors, specifically labor and land. It has been little affected by capital intensification and technological improvements. Indeed, this is explained by a low level of irrigation, and a low use of improved seeds and plants, fertilizers, improved breeds, and phytosanitary and animal health products, etc. It is also the result of inadequate inputs available and accessible on the national markets especially with regard to fertilizers.

Beyond capital intensification and technological improvement, the improvement of the sector's environment is proving to be a fundamental component. However, levels of public and private investment in agricultural research and development, infrastructure and education, particularly in rural areas, have remained low. More generally, it is a weak set-up of conditions that can stimulate technological improvements along the integrated value chains, technology transfer and the adoption of new techniques, together with the complex challenge of mobilizing financial resources.

On the public expenditure side of the agricultural sector, data from the IFPRI (International Food Policy Research Institute) indicate that of the 48 African countries with available data, in 2014 only three (Malawi, Mozambique and Liberia) exceeded the 10% threshold of public spending on agriculture set by African Heads of State in 2003 as part of the Maputo Declaration (see Figure 7). Similarly, these three countries tend to increase their public spending in agriculture. A total of 45 countries have

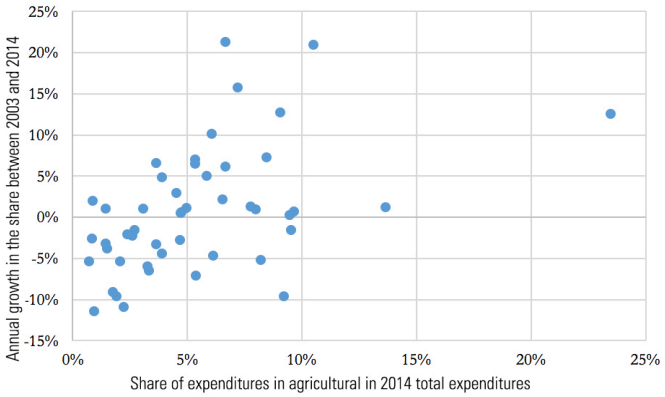
Figure 6 : Croissance de la PTF et contribution à la croissance de la production agricole



Source : calculs des auteurs

a share of expenditure in agriculture of less than 10%. Between 2003, the year of the Maputo Declaration, and 2014, in these 45 countries, 22 (almost half) have tended to reduce their share of public expenditure on agriculture. Clearly, between economic challenges, budgetary constraints, and political will to act for the agricultural sector, several countries on the continent are struggling to achieve their objectives.

Figure 7: Shares of public expenditure in agriculture and changes in these shares



Source: RESAKSS/IFPRI

The efforts of African countries in agricultural research are also weak despite the increasing need for the development of technologies adapted to production environments. According to the latest data provided by the International Food Policy Research Institute (IFPRI) through the Agricultural Science and Technology Indicators (ASTIs), expenditure on agricultural research (measured in PPP dollars in 2011) made up 5% of the gross domestic product of the 43 African countries whose data are available. Worse still, this share exceeds the 1% mark in only 6 of these 43 countries.

«Capitalize on local know-how and technologies.»

Infrastructure is one of the main components that enable technology transfer, and access to factor and product markets, thus contributing to productivity improvements. Indeed, the existence and connection to the international markets for plant and animal production inputs through quality infrastructure (ports, roads, logistics, etc.) makes it possible to considerably reduce the cost of their supply. The lack of or poor quality of infrastructure is currently the source of the high transportation costs. Today, much of the high price of fertilizer in Africa is due to transportation costs. For the small farmer, improving the quality of infrastructure will therefore have a beneficial effect because a reduction in input supply expenditures is an incentive to produce more. This will also benefit the many African states that have subsidy policies because they weigh heavily on their budgets.

If one considers only the African performances in terms of road infrastructure, the observation is not very good. According to the World Economic Forum's latest Global Competitiveness Report (2015), of the 151 countries from which various competitiveness criteria were assessed, 17 of the 37 African countries are ranked between 100 and 150 with regard to road quality, i.e. about half of the classified countries. In the top, 15 of these 37 countries are ranked between 50 and 100. Finally, the top 5 countries are ranked between 1 and 50, the best being Namibia with a rank of 28 out of 151 and a score of 5.2 (compared to a maximum score of 6.6, reached by the United Arab Emirates). The scores of the 37 African ranked countries range from 1.9 (Guinea, ranking 140th in the global ranking) to 5.2 (Namibia, ranked 28th in the global ranking).

Conclusions and implications

Agricultural growth in Africa has mostly been driven by the use of more land and more labor. This situation, which is – among other things – the result of insufficient structural economic transformation, has led to insufficient overall agricultural productivity growth needed to induce a real reduction in poverty. Indeed, the increase in the use of labor and land factors resulted in "an expansion of agriculture." This, coupled with the small increase in agricultural productivity, resulted in a small increase in income. To cope with this situation, it is obviously up to States to put in place effective measures to improve agricultural productivity.

To increase productivity in the agricultural sector in Africa, states need to improve investment levels in agricultural research and development (R&D). This is of major importance in the current context of climate change adaptation and mitigation. Agricultural R&D has the challenge of generating technologies that are both highly productive (yields), but also help preserve the quality of natural production capital (soil fertility, availability and quality of water resources, etc.). R&D should not be limited to the development of new varieties of seeds and seedlings, but should extend to all technical approaches including adapting them to local conditions. If technology transfer is important, it would be wise to capitalize on local know-how and technologies.

These technology transfers must be accompanied by a major effort in agricultural extension, rural education, and improved market access conditions. Improved infrastructure reduces transaction costs and creates new opportunities. The development of irrigation, the rational use of inputs, other essential pillars of progress in productivity, also require adequate investment. The large investments required can only be met by expanding financing strategies to the adoption of new mechanisms, notably by involving the private sector and by mobilizing previously untapped resources.

Thus, the "double green" revolution in agriculture in Africa that is expected today needs to be integrated into a consolidated set of political, economic, trade and fiscal reforms, accompanied by investment in R&D, irrigation, land improvements, rational use of inputs, extension, and technological adoption.

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