THE GAMBIA: A LOOK AT AGRICULTURE

WORLD BANK GROUP

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Authors

Rose Mungai

Guy Morel Kossivi Amouzou Agbe

Supervisor

Andrew Dabalen

Editor

Lauri Scherer

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Acknowledgments

This note was prepared by Rose Mungai (Senior Economist/Statistician, TTL) and Guy Morel Kossivi Amouzou Agbe (Consultant).

Comments and suggestions were provided by Aly Sanoh (Senior Economist/Statistician), Habtamu Neda Fuje (Economist), and Remi Kini (Senior Agriculture Economist). The report was developed under the guidance of Andrew Dabalen (Practice Manager, GPV07).

Abbreviations

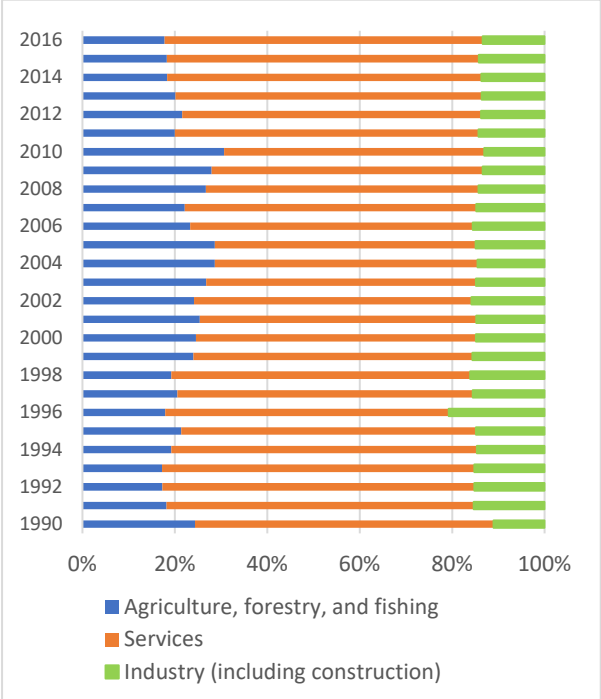
FAO	Food and Agricultural Organization
FAOSTAT	FAO statistical database
GoTG	Government of The Gambia
GDP	Gross Domestic Product
IFAD	International Fund for Agricultural Development
IHS	Integrated Household Survey
ILO	International Labour Organization
LCU	Local Currency Unit
MSY	Maximum Sustainable Yield
MT	Metric Ton
NARI	National Agricultural Research Institute
NAWEC	National Water and Electrical Cooperation
NGO	Nongovernmental organization
PPP	purchasing power parity
TFP	total factor productivity
US$	U.S. dollar
USDA	U.S. Department of Agriculture

1. The Importance of Agriculture

Agriculture is a vital sector in The Gambia. It accounts for about 17.8 percent of gross domestic product (GDP), ranking behind the services sector, which recorded 68.8 percent of GDP (value added) in 2016 (Figure 1). The largest contributor to GDP remains the services sector, which is also the fastest-growing sector. Both the agriculture and industry sectors have had mixed performances. The agriculture sector has continued to underperform compared to the rest of the economy, and its share in GDP has been shrinking; it declined from 29.0 percent in 2010 to 16.9 percent in 2017. Agriculture is dominated by smallholders who account for a large share of domestic production with low use of improved technology.

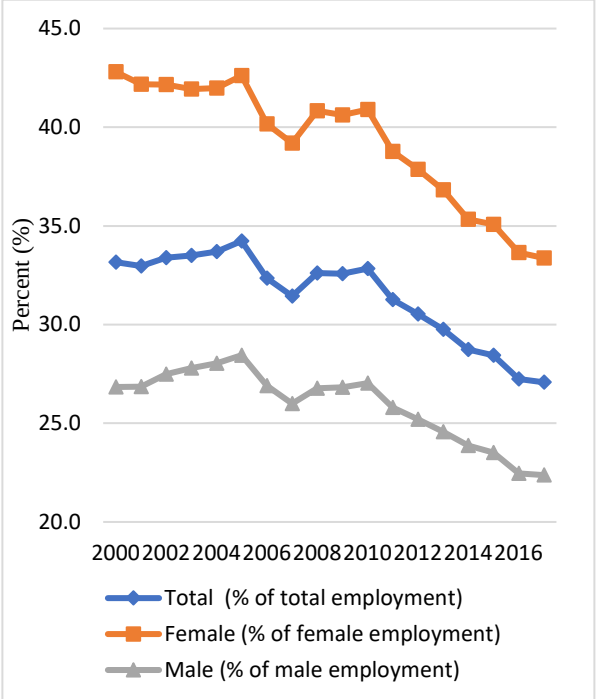
In 2017 the agriculture sector provided 27.1 percent of total employment in The Gambia, according to International Labour Organization (ILO) estimates (Figure 2). Employment in agriculture appears to be mainly driven by women, who are more likely to engage than men. ILO estimates show that the gender gap in participation in the agriculture sector was 10 percentage points during the period 2000–17. In general, more than two-thirds of Gambians reside in rural areas and derive their livelihoods from agriculture and related activities. Therefore, the sector is a prime area for investment to achieve poverty reduction as stated in the country's Vision 2020 document.

Figure 1: Sector composition of gross domestic growth (%)



Source: World Development Indicators.

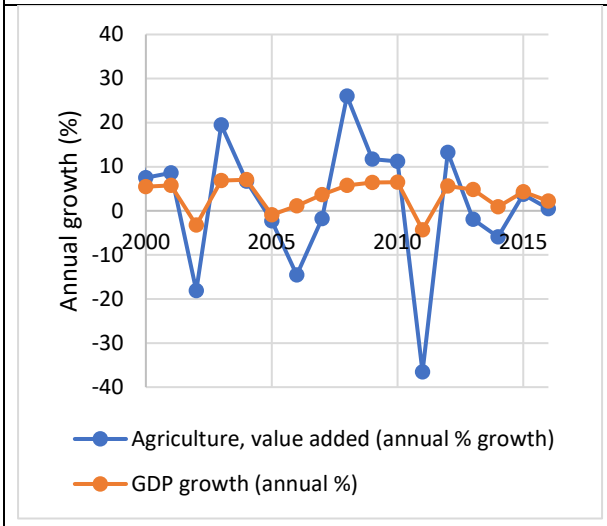
Figure 2: Employment in agriculture has been declining steadily



Source: World Development Indicators.

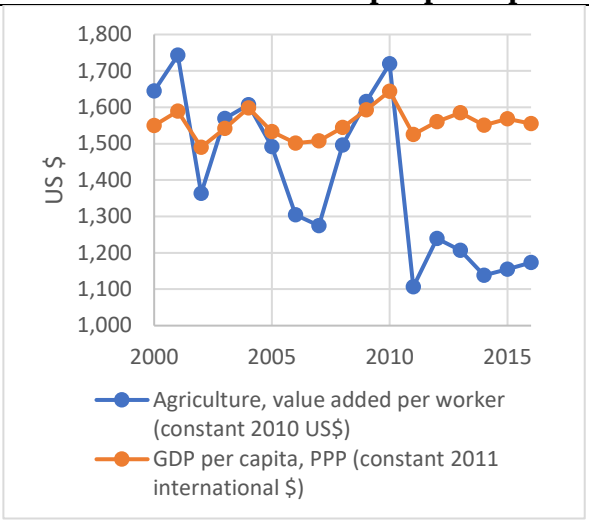
There is a strong correlation between agriculture and GDP growth. As depicted by Figure 3, agriculture and GDP growth have identical trends. In 2002 and 2011, declines in economic growth have been associated with reductions in agricultural production. This provides a possible hypothesis that a decrease in agricultural production will result in slower economic growth, thus increasing poverty risks. A similar correlation is observed between GDP per capita (Figure 4).

Figure 3: Declines in agriculture growth correlate with declines in GDP



Source: World Development Indicators.

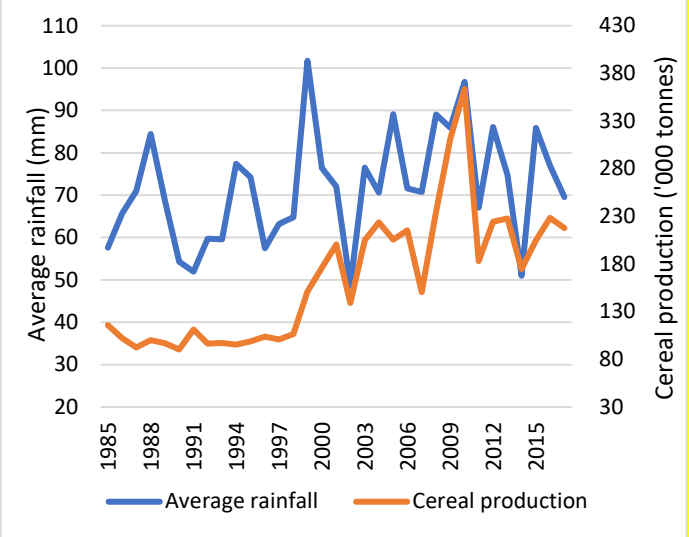
Figure 4: A similar correlation can be observed in terms of output per capita



Source: World Development Indicators.
Note: PPP = purchasing power parity.

Increased climate variability threatens production. The increased climate variability, recurring droughts, flooding, and sea level rise since 2001 have led to crop failures and poor harvests. A drought occurred in 2001–02, and severe droughts hit in 2004–05 and 2010–11. In 2013–14 and again in 2015–16, the country experienced an untimely season with the late onset and early end of the rainy season (Figure 5).

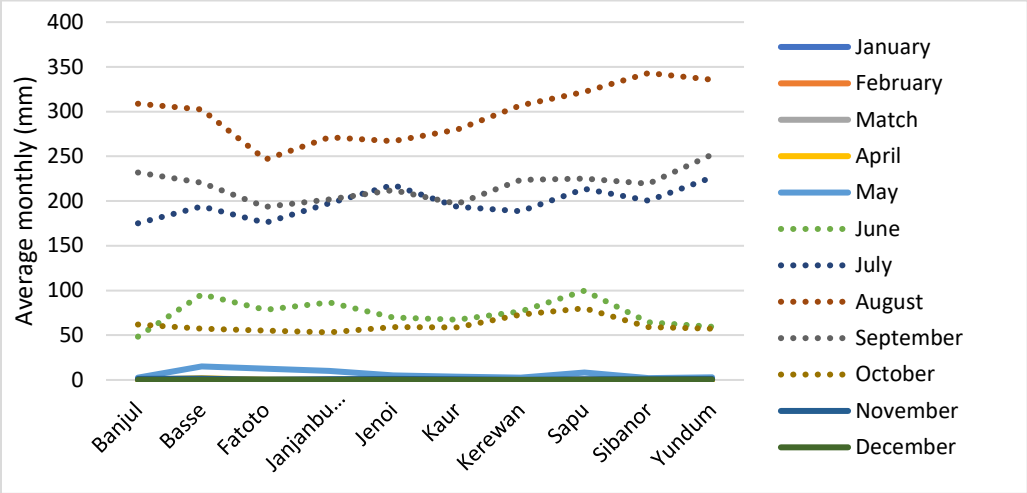
Figure 5: Increased climate variability threatens production



Sources: Based on Department of Water Resources (rainfall) and FAOSTAT (cereal production).

The climate of The Gambia is characterized by one rainy season with 98 percent of the rainfall occurring between June and October (Figure 6), which happens to be the planting season. About 37 percent of the rainfall happens in August, but there is considerable spatial and temporal variation. This is followed by a long dry season that is characterized by the harmattan winds (Figure 6). Average temperature ranges from a low of 18°C to a high of 36°C. The yield potential of crops mainly depends on climate.

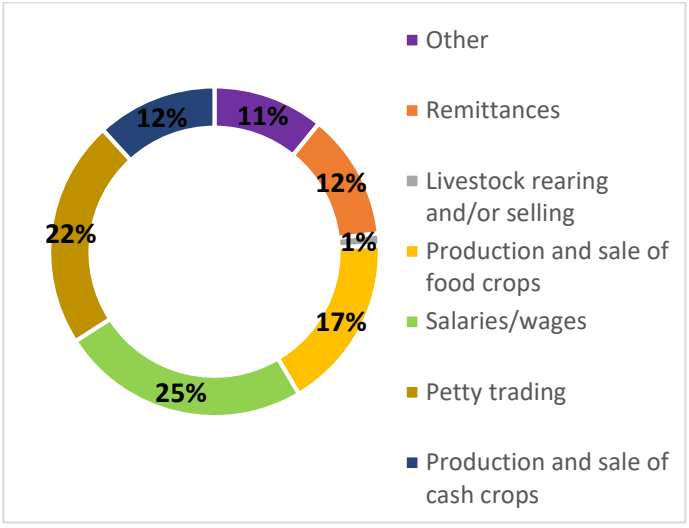
Figure 6: Rainfall pattern is a short monomodal season



Source: Department of Water Resources.

Agriculture is an important source of income for households, behind wages/salaries and petty trading. A significant proportion of households earn their income from agricultural activities such as livestock rearing and/or selling and the production and sale of food crops, including cash crops. According to a nationally representative sample survey covering both urban and rural areas undertaken by the World Food Programme in 2016, a significant proportion of respondents—about 32.5 percent—reported agriculture (crops and animal husbandry) as a major source of household income (Figure 7). The reliance on agriculture as a source of income was strongest among rural households, which are the main ones engaged in agriculture.

Figure 7: Agriculture is an important source of income for households



Source: WFP 2016.

The agriculture sector plays an important role in ending hunger, malnutrition, and extreme poverty. Since 1994, The Gambia has been defining and implementing a series of poverty alleviation and reduction strategies; in particular, it has been addressing internationally shared goals of eradicating hunger, malnutrition, and extreme poverty. In each of these policies, the agriculture and natural resources sector has featured prominently. Table 1 shows that agricultural households are more likely to be poor compared to nonagricultural households. Indeed, more than 6 out of 10 individuals from an agricultural household are estimated to be poor, according to the country's Integrated Household Survey (IHS) 2015/16. Among nonagricultural households, this proportion is 26.8 percent. In the same spirit, the IHS 2015/16 survey reveals that other relevant poverty indicators are worse for agricultural households. This shows that agriculture has not yet reached maturity in The Gambia, and farmers have yet to fully benefit from its immense opportunities; agricultural development is believed to be one of the most powerful tools to end extreme poverty and boost shared prosperity.

Table 1 : Poverty indices for agricultural and nonagricultural households (%)

	Head count	Poverty gap	Severity of poverty
The Gambia	48.6	15.5	6.7
Nonfarm	26.8	5.9	1.9
Farm	64.8	22.6	10.3
Livestock only	43.5	12.3	4.6
Agriculture only	62.4	19.8	8.2
Agriculture and livestock	68.8	24.9	11.7

Source: Authors' calculations based on the IHS 2015/16.

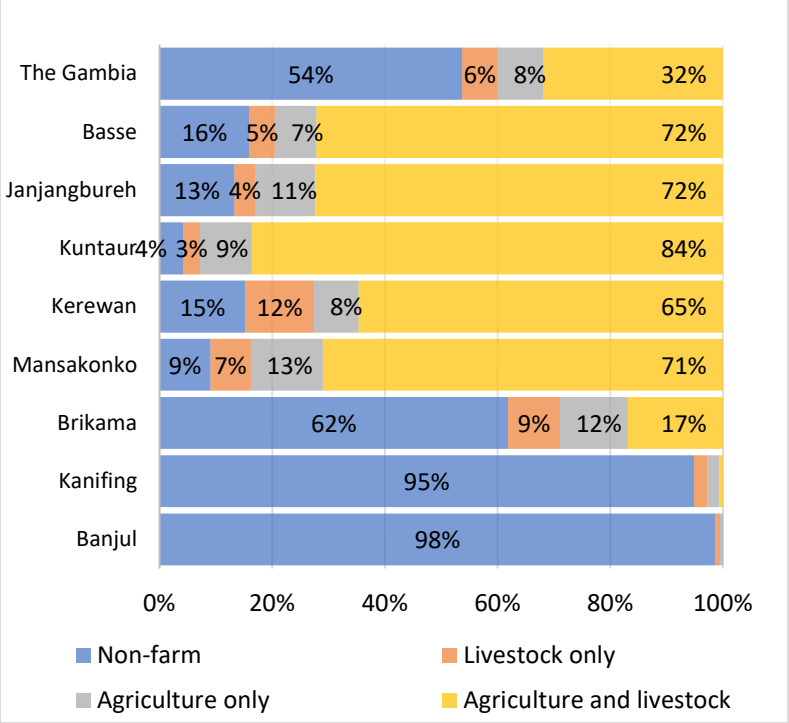
In rural areas, the agriculture sector's role in poverty reduction and shared prosperity policies is particularly important. Although poverty is endemic in The Gambia, the incidence of poverty is higher in the rural areas. Data from the IHS 2015/16 indicate that whereas 59 percent of rural households fall below the poverty line, only 20 percent do in urban areas. People in rural areas are prone to poverty and food deficits during the peak of the rainy season (July–September), when household food stocks and cash are low and labor requirements are high. The same survey indicates that 86 percent of the extremely poor and 73 percent of the poor work in agriculture. Consequently, in the rural areas, the agriculture sector is the prime sector for investment to improve food security and reduce poverty. The agriculture sector is characterized by a lack of diversification—consisting mainly of subsistence rain-fed agriculture—with a food self-sufficiency ration of about 50 percent. This is consistent with the IHS data that showed that over 50 percent of the population were considered food poor.

Land ownership is low among female farmers. In The Gambia, land-use management and administration are protected by the State Lands Act of 1991; the Lands Provinces Act, chapter 57:03, of the Laws of The Gambia; the Physical Planning and Development Control Act of 1991; the Land Acquisition and Compensation Act of 1991; and the Land Survey's Act of 1991. Land is divided into provincial lands, which are regulated by customary law under the Lands Provinces Act, and state lands (forest parks, national parks, and reserves), which are administered and managed under the State Lands Act of 1991. However, the population is mostly unaware of these legislative acts, and each village has land that falls within the jurisdiction of its own headman that may be in conflict (Jaiteh 2016). This land-tenure complexity tends to be biased against women. **According to the 2001–02 agricultural census, only 8.3 percent of total agricultural holders[1] were women.**

Cultivable land remains underutilized in The Gambia. The area of arable, cultivable land has expanded from 280,000 hectares (ha) in 2000 to 440,000 ha in 2016, representing a growth rate of approximately 8 percent. But only 57.3 percent of the land is cultivated. The percentage of land used for permanent crops has remained flat.

Land-use composition is changing rapidly in The Gambia. In 2001 cultivated land accounted for about 28 percent of the total land area, and woodlands accounted for about 42 percent. But woodlands that included mangroves had covered an estimated 81 percent of the land area in 1946 (FAO 1981). By 2001, total woodland and mangrove area represented less than 50 percent of the land area. Figure 8 shows the distribution of farm and nonfarm households by Local Government Area. Kuntaur has the largest share of farm households.

Figure 8: Distribution of farm/nonfarm households by area of residence



Source: Authors' calculations based on the IHS 2015/16.

[1] The agricultural holder is the civil or juridical person who makes the major decisions regarding resource use and management control over the agricultural holding. The agricultural holder has technical and economic responsibility for the holding.

Food insecurity levels are high in some regions. The most affected regions are Janjanbureh, Brikama, Kuntaur, Mansakonko, and Kerewan, where approximately 6 out of 10 Gambians cannot meet the daily minimum requirement of 2,400 kilocalories (Figure 9). It appears clearly that food poverty is high in The Gambia and is closely linked to farming communities (Figure 10). The development of the agriculture sector can help in many ways to reduce food poverty in these regions by generating more income and reducing the gap between food requirements and food supply. Furthermore, food poverty is high in areas where the main occupation is agriculture.

Figure 9: More than 5 out of 10 persons cannot meet the daily minimum required calories

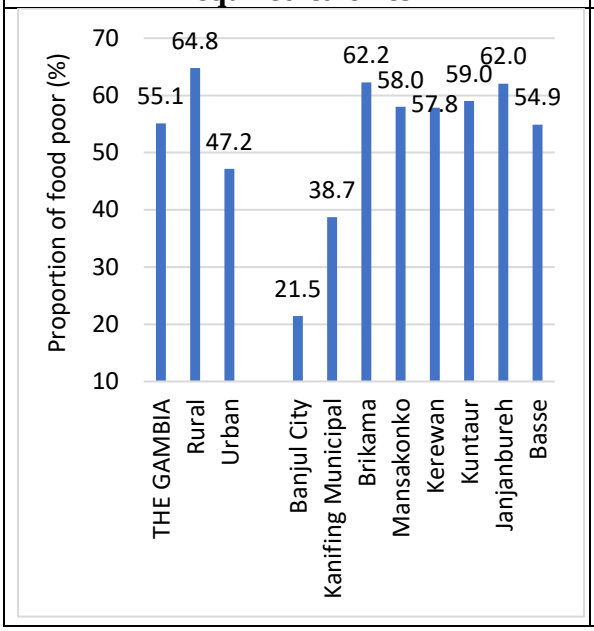
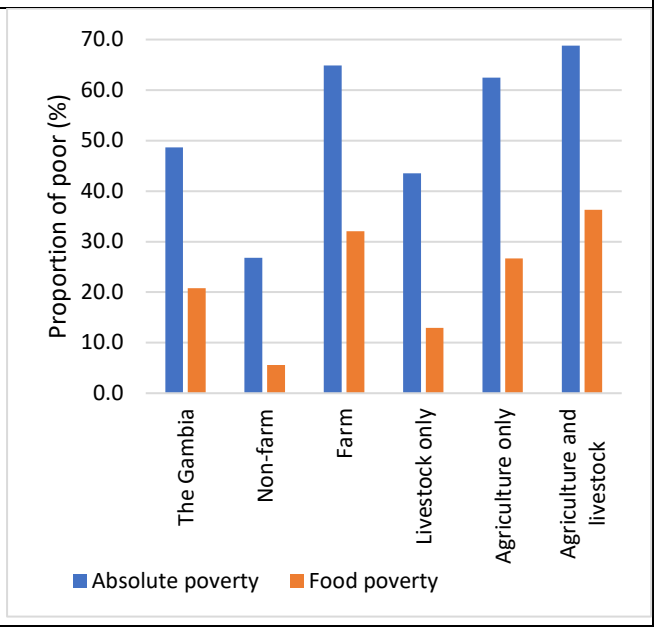


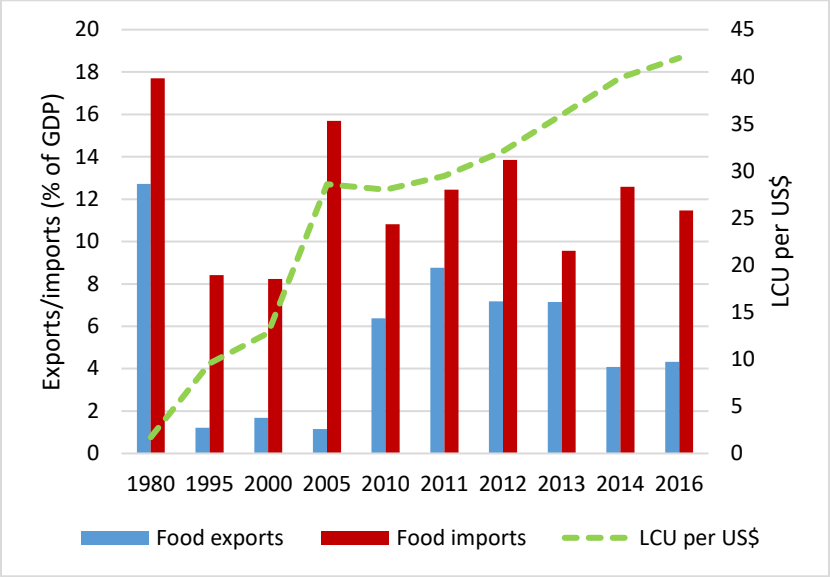
Figure 10: Poverty closely linked to agriculture



Source: Authors' calculations based on the IHS 2015/16.

Concerning food self-sufficiency, domestic production is still insufficient, creating an important food gap to fill. Food production for local consumption depends heavily on climate. The Gambia is also far from being food self-sufficient and produces only about 50 percent of its domestic requirements. The widening gap between food production and consumption must be filled by importation (commercial and food aid), which constitutes an important drain on the limited foreign exchange generated in the economy (Figure 11). As a net importer of food crops, food prices are strongly affected by the exchange rate of the Gambian dalasi. This creates inflationary pressures on the domestic market, thereby eroding the purchasing power of consumers.

Figure 11: Food imports continue to rise as a share of GDP

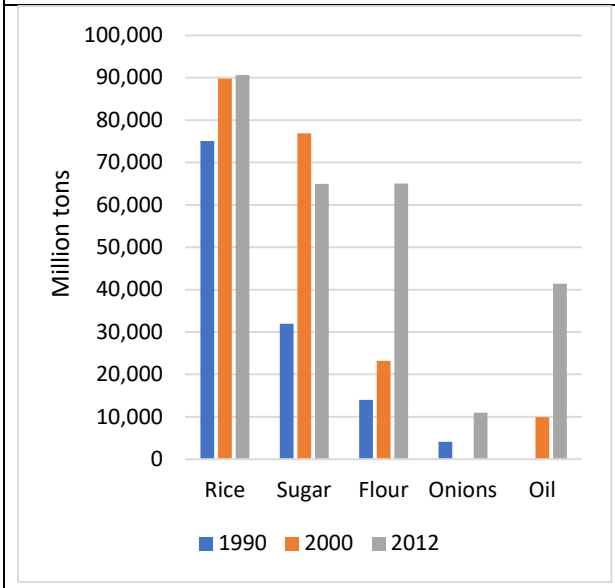


Source: World Development Indicators.

Note: LCU = local currency unit.

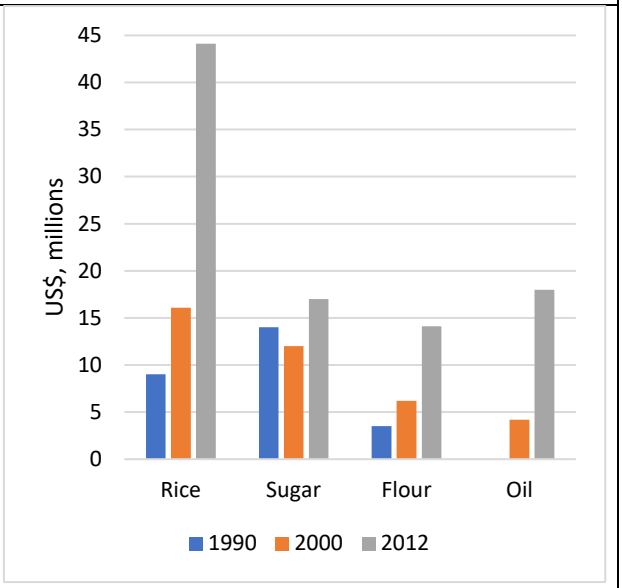
Imports of the top five foodstuffs in the country have increased in value and quantity. According to the FAO (Jaiteh 2016), the trend of importing the top five foodstuffs has increased considerably (Figure 12). Rice is a staple consumed at an average of 117 kilograms (kg) per capita, and it is the main food crop imported, with current annual imports weighing heavily on the country's trade balance (Figure 13). The Gambia has one of the highest per capita consumption rates of rice in the region. Local production only represents a small fraction of the amount of rice consumed; most is imported (Figure 14). The quantity of rice imported increased from 75.1 billion tons in 1990 to 90.6 billion tons in 2012, registering a value of US$13.9 million and US$44.1 million, respectively. For sugar, the volume imported rose from 32.0 billion tons in 1990 to 66.0 billion tons in 2012, representing a value of US$13.9 million and US$16.5 million, respectively. Flour, oil, and onion imports also increased (Figure 15). Unless local production is enhanced, this demand for imported rice, sugar, flour, oil, and onions will probably remain strong given the population growth rate (about 3 percent per annum).

Figure 12: Quantity imported of rice, sugar, flour, onions, and oil increased from 1990 to 2012



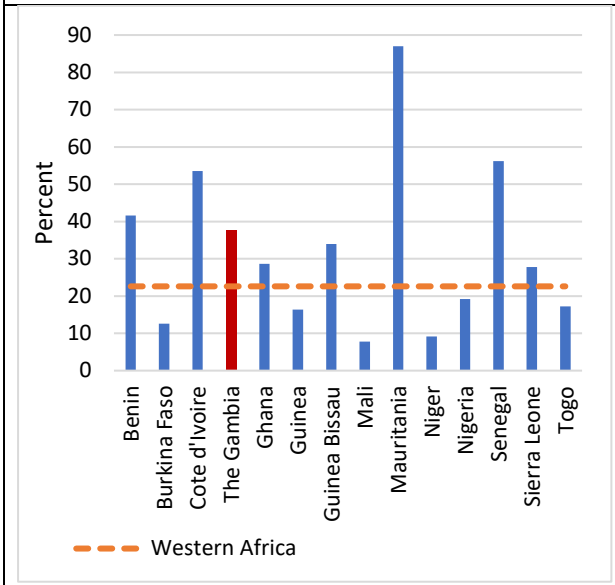
Source: Jaiteh 2016.

Figure 13: Increasing significantly the value of importation



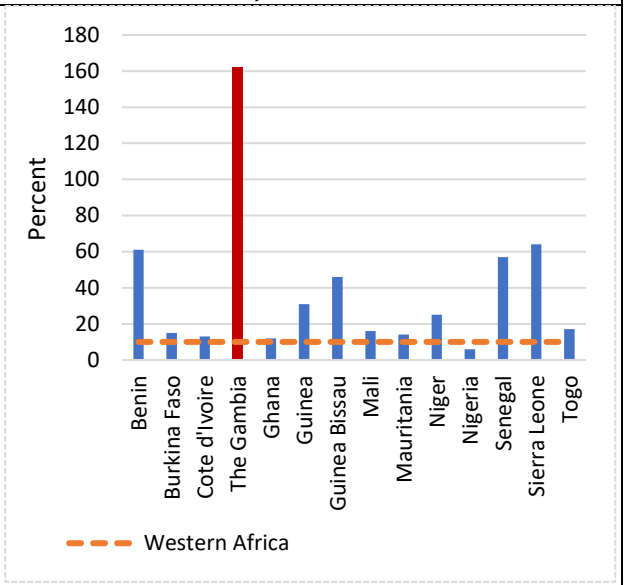
Source: Jaiteh 2016.

Figure 14: Cereal import dependency ratio of The Gambia is above West African average



Source: Authors' calculations based on FAOSTAT, 2016.

Figure 15: The Gambia has one of the highest values of food imports over total merchandise exports (3-year average), 2011–13, in West Africa



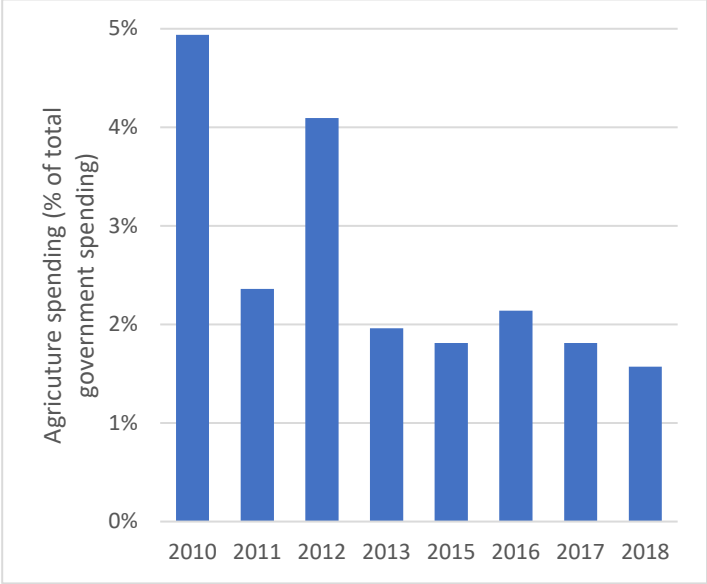
Source: Authors' calculations based on FAOSTAT, 2016.

The Government of The Gambia and its development partners acknowledge the strategic importance of the agriculture sector. Agriculture is well positioned in the Government's goal of

making the country both middle income and food self-sufficient by 2020. The sector is important for achieving national food self-sufficiency and security, creating employment, and generating income for most of the rural population, which depends heavily on agriculture and/or agriculture-related activities.

Though acknowledged as a vital sector to assure food self-sufficiency and security and reduce poverty, investment in agriculture is still too weak to foster considerable economic growth. In 2003 The Gambia and other countries in Africa pledged to allocate 10 percent of their national budgets to the agricultural sector in the Maputo Declaration. To date, the country's actual annual allocation for the sector has been very low and is less than the pledged target in the declaration. Public investment in the sector appears marginal (Figure 16). The Government of The Gambia is adopting a public-private partnership approach to fill the critical investment and service gaps in the agricultural and rural development sectors. The International Fund for Agricultural Development (IFAD), in collaboration with the World Bank Group, is assisting the Government to implement a private sector policy framework. This framework would focus on agricultural input service delivery to foster private sector investment, with the public sector as a facilitator and catalyst.

Figure 16: Government spending on agriculture is low and fluctuates



Source: Based on data from the Ministry of Finance and Planning

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Recent important investment in the sector can, however, be praised. The fisheries subsector, for instance, has been dormant for a long time. Currently, the country is at the point of benefiting from a $30 million fisheries program. Indeed, The Gambia will benefit from the second phase of the West African Regional Fisheries Program, and the expected investment aims to develop fish landing sites and add value to the fisheries products for improved food security and poverty eradication. The development of fisheries and aquaculture will help enhance nutrition and employment creation.

The existence of successful agricultural programs and projects encourages investment in the sector. Among these successful actions are the Lowland Agricultural Development Programme,

funded by IFAD and the African Development Bank; the Special Programme for Food Security, funded by the Government of Italy, the Inter-American Development Bank, and the Food and Agriculture Organization (FAO) of the United Nations; and the Rural Finance and Community Improvement Programme, also funded by IFAD. All of these programs involve multiple stakeholders and interventions. They represent important past lessons for more efficient and coordinated present and future programs.

The sector offers immense opportunities for crop production, fishing, and agro-industrial development. The Gambia has 558,000 ha of good-quality arable land, of which an average of 300,000 ha, or about 54 percent of total area, are cultivated annually (GoTG 2015). The country has a great potential for irrigated agriculture, with fresh water from the Gambia River. It also offers immense opportunity for value-added processing and transformation of all agricultural products, for both the local and international markets. The country is currently at the implementation stage of the Vision 2020 blueprint and hopes to become an export-oriented agricultural nation capable of transforming and processing all agricultural products—for both local and international markets—through a reputable, high-quality national brand.

The Gambia's salt and fresh waters have abundant, diverse resources. The country has a total continental shelf area of 3,855 square kilometers on the Atlantic Ocean and is located in one of the world's richest fishing zones. Species present include pelagic and demersal fish, crustaceans, and shellfish. Marine fish resources are enhanced by the freshwater flows of the Gambia River. Prolific mangroves support thriving ecosystems, and the brackish and freshwater zones of the middle and upper regions are also rich in crabs and shrimp, with great potential for aquaculture. With a theoretical annual maximum sustainable yield, or MSY, between 65,000 and 75,000 metric tons (MT), and an estimated annual exploitation of about 45,000 MT, fishery resources are still underexploited, according to the FAO.

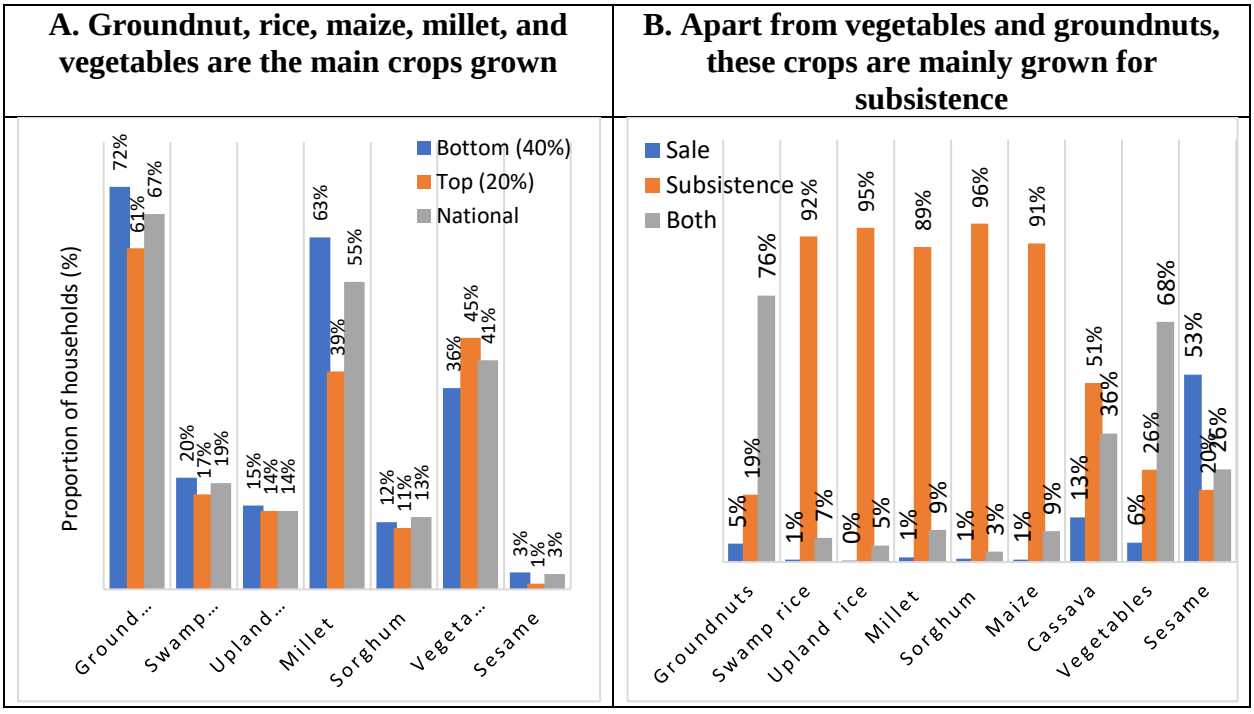
2. Performance

Agriculture in The Gambia is heterogenous across agroecological zones. Based on the rainfall pattern, there are three major agroecological zones in The Gambia: the Sahelian, the Sudan-Sahelian, and the Sudan-Guinean zones. The *Sahelian zone* has a Sahelian microclimate with open savannah vegetation during the dry season. Rainfall is unpredictable but does not exceed 600 millimeters (mm) annually. The effective crop-growing season in this zone is less than 79 days. The soil has a low water-retention capacity and is not suited for long-duration crops. Thus, early-maturing, short-duration, and drought-tolerant crops are cultivated in this zone. Cassava, sesame, and cowpeas are the main produce, with millet grown occasionally. The *Sudan-Sahelian zone* lies within the 600–900-mm rainfall area. With a longer growing season, 79–119 days, the upland areas are well suited to groundnuts, cotton, and sorghum. The flood plains along the Gambia River and its lowland valley systems are excellent rice-growing catchments under tidal swamp

irrigation. The *Sudan-Guinean zone* lies within the 900–1,200 mm rainfall isohyets. The growing season lasts 120–150 days, and in normal seasons, full crop water requirements are met throughout the growing season. In some lowland areas, the long dry season results in increased salinization of the Gambia River and a reliance on saline-tolerant rice varieties. The principal crops cultivated in this agroecological zone are early millet, groundnuts, rice (rain-fed upland and lowland, irrigated lowland, mangrove and salt-tolerant mangrove), maize, vegetables, sesame, and cowpeas.

A traditional subsistence farming method, mainly based on monocropping. Gambian agriculture is mainly a subsistence production of food crops consisting of cereals: millet, maize, sorghum, and rice (Figure 17, panel A). Of these, rice, sorghum, and millet are the most important crops (Figure 17, panel B), and rice is the staple that is consumed at an average of 117 kg per person. Semi-intensive cash crop production (groundnuts, cotton, sesame, and horticulture) is also practiced at a very small scale. About 87.4 percent of farmers are engaged in monocropping, according to the IHS 2015/16. At this stage, the sector does not generate enough revenues for most crop farmers. Livestock production is still predominantly traditional. Horticultural activities, such as growing vegetables and fruits, and livestock raising should be perceived as alternatives to generate additional revenues. Mixed farming and cropping are strategies that can help agricultural households diversify their revenues, as can fishing. The contribution of the fisheries subsector to the nutritional, economic, and social well-being of agricultural households, as well as to the country's growing population in general, can be considerable. This is reasonable as the subsector can benefit a lot from the Gambia River and its significant fishery resources.

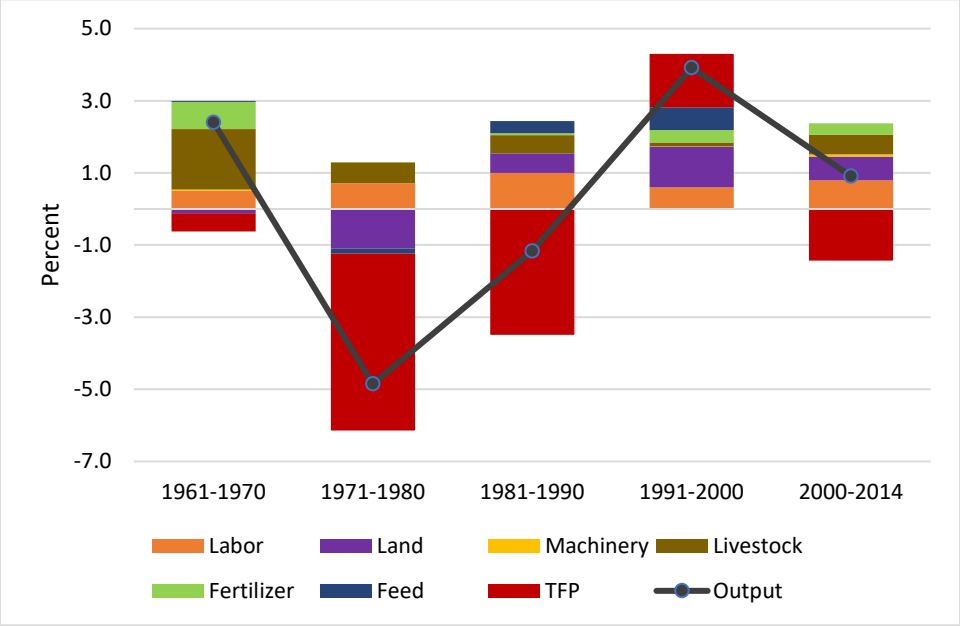
Figure 17: Major crops grown in The Gambia



Source: Authors' calculations based on IHS 2015/16.

Since the 1960s, the agriculture sector has been mostly underproductive. With the exception of 1991–2000, sector production has grown slower than the use of inputs in general, resulting in a negative total factor productivity (TFP). TFP considers all the land, labor, capital, and material resources employed in farm production and compares them with the total amount of crop and livestock output. It provides a broader concept of agricultural productivity than measures that compare output to just one input, such as land or labor.[2] A negative TFP growth rate may signal an inefficiency in the transformation of inputs to output, whereas a positive TFP growth rate may signal efficiency in the sector (Figure 18). This was the case during 1991–2000, when efficiency in the use of agricultural inputs contributed positively and significantly to the growth of the sector. Unfortunately, this efficiency was not maintained and degraded between 2001 and 2014. In general, land and labor appear to be the most important drivers of agricultural growth in The Gambia, behind TFP (except between 1961 and 1970, when the contribution to the growth of livestock as a capital input was the most important). Between 2001 and 2014, a significant gain in the contribution to agricultural growth came from fertilizer use.

Figure 18: Since the 1960s, agricultural outputs in The Gambia have increased slower than agricultural inputs in general, except between 1991 and 2000



Source: Authors' calculations based on USDA, 2018.

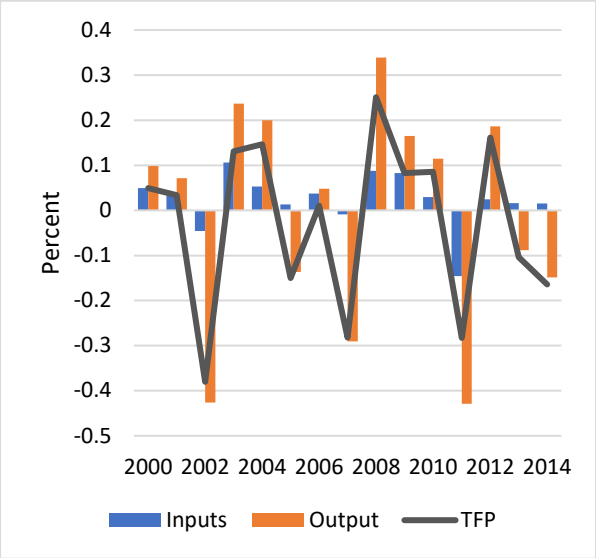
Note: TFP = total factor productivity.

[2] See Fuglie (2015), "Accounting for Growth in Global Agriculture" for more details on methodology, data, and measures. *Agricultural output* here refers to the FAO gross agricultural output calculated as the sum of the value of production of 189 crop and livestock commodities, valued at constant, global-average prices from 2004–06 and measuring in 2005 international dollars. Agricultural inputs considered are labor, land, machinery, livestock, fertilizer, and animal feed.

The weak average performance of the sector between 2001 and 2014 hides significant disparities within years. Notably, the years 2003, 2004, 2008, and 2012 are characterized by gains in efficiency where production has grown faster than the use of inputs in general (Figure 19). Meanwhile, the years 2002, 2007, and 2011 show significant drops in efficiency. The use of agricultural inputs during this time grew faster than production, and this tendency persisted during 2013 and 2014. Surprisingly, despite growth in agricultural inputs, production did not follow as it should have during these years. The reason for this production lag may be the sector's limited technology (agricultural practice in The Gambia is mainly traditional), which could not effectively transform inputs into outputs. Increased fertilizer use and land expansion appear highly correlated with production compared to other inputs (Figure 20).

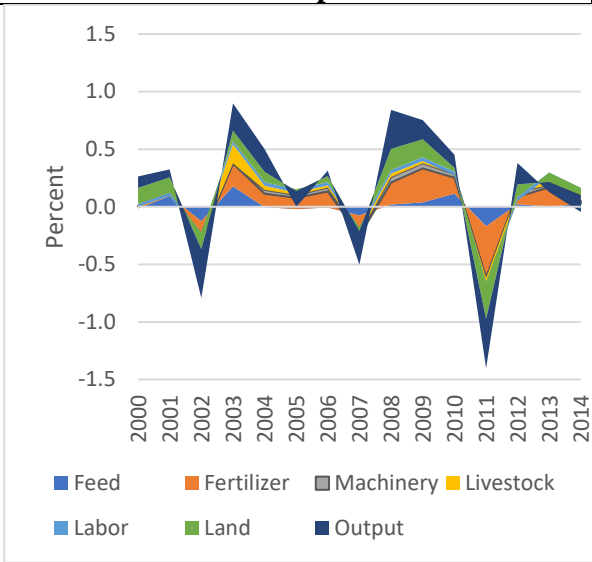
The production of major crops has fluctuated with different levels of performance. The agriculture sector in The Gambia is mainly driven by the crop production subsector. The major crops are mainly cereals (rice, millet, sorghum) and groundnuts. Although the production of sorghum appears relatively stable between 2000 and 2014, the other crops show great variations (Figure 21). The year 2011 was one of the most difficult, with a considerable decline in agricultural production mainly caused by late, erratic, and unevenly distributed rainfall (Figure 22). In 1999 severe floods[3] hit The Gambia; since then, the rice paddy yield has dropped significantly and has remained below 1,700 kg/ha (productivity of 2,200 kg/ha in 2000).

Figure 19: Sector performance fluctuated over the last two decades, with significant productivity drops and gains



Source: Authors' calculations based on USDA, 2018.
Note: TFP = total factor productivity.

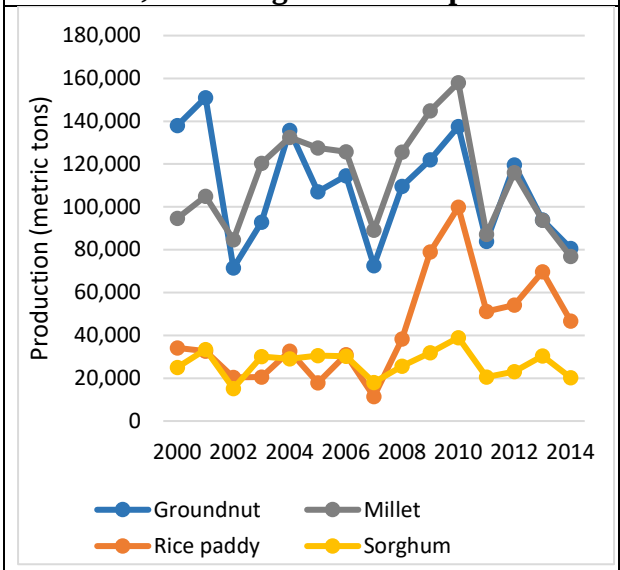
Figure 20: Agricultural output growth was highly correlated with fertilizer use and land expansion



Source: Authors' calculations based on USDA, 2018.

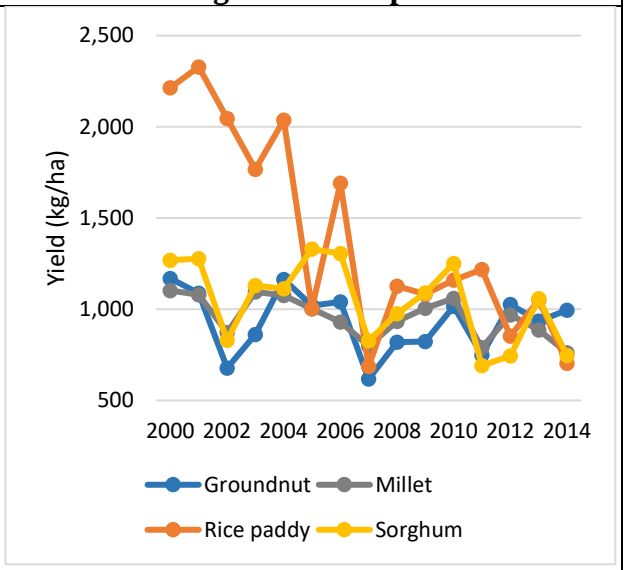
[3] Floods in 2002, 2005, 2007, 2009, and 2010 caused food insecurity.

Figure 21: Production of main crops was erratic, with a significant drop in 2011



Source: Authors' calculations based on FAOSTAT, 2018.

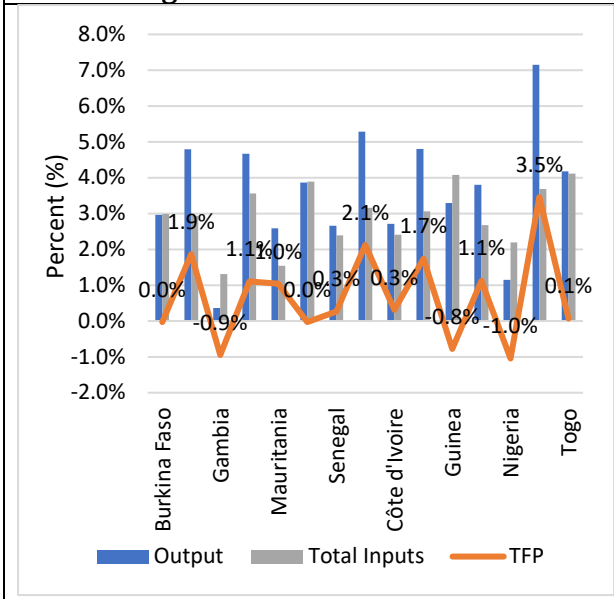
Figure 22: Yield of main crops was erratic, with a significant drop in 2011



Source: Authors' calculations based on FAOSTAT, 2018.

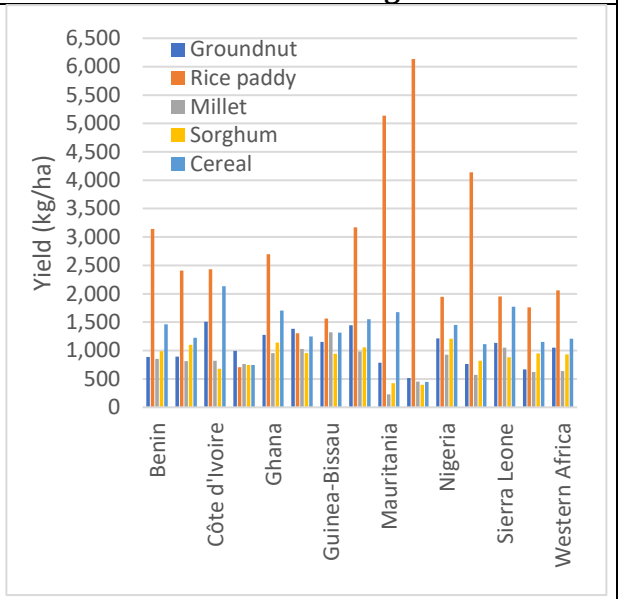
Unlike most other West African countries, The Gambia had a negative TFP growth rate between 2001 and 2014. During this period, most agricultural inputs (land, labor, machinery, livestock) had moderate growth. Sector production, however, remained weak. This resulted in a negative TFP growth rate while most other West African countries recorded positive rates (Figure 23). Despite substantial growth in the labor force and the expansion of cultivable areas (Figures 25 and 26) in The Gambia, farm productivity has not improved or, in fact, has declined. The yields of major crops in The Gambia remained quite low due to limiting factors such as erratic rainfall, inappropriate farming techniques, limited access to modern inputs markets, systems of tenure, and weak producer organizations (Figure 24). In the current context, efficient policies driving agricultural productivity growth in The Gambia should include investments in research and development, economic reforms that strengthen incentives for farmers, rural education and extension, and improved infrastructure (Figure 27).

Figure 23: The Gambia had one of the less-efficient agriculture sectors in the subregion between 2001 and 2014



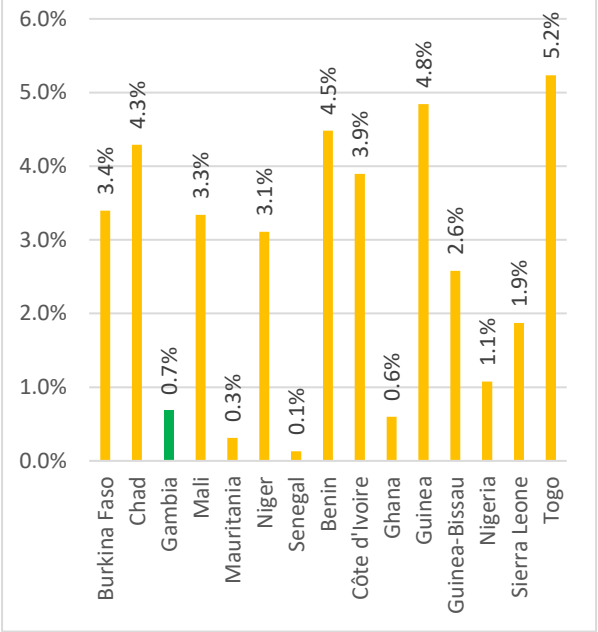
Source: Authors' calculations based on USDA, 2018.
Note: TFP = total factor productivity.

Figure 24: Yield of the main crop grown in The Gambia in 2014 was beyond West African average



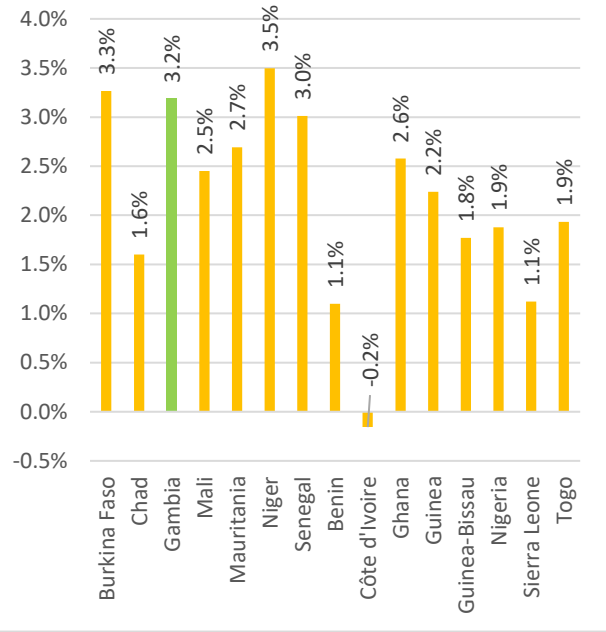
Source: Authors' calculations based on USDA, 2018.

Figure 25: Agricultural land expansion was relatively moderate in The Gambia between 2001 and 2014



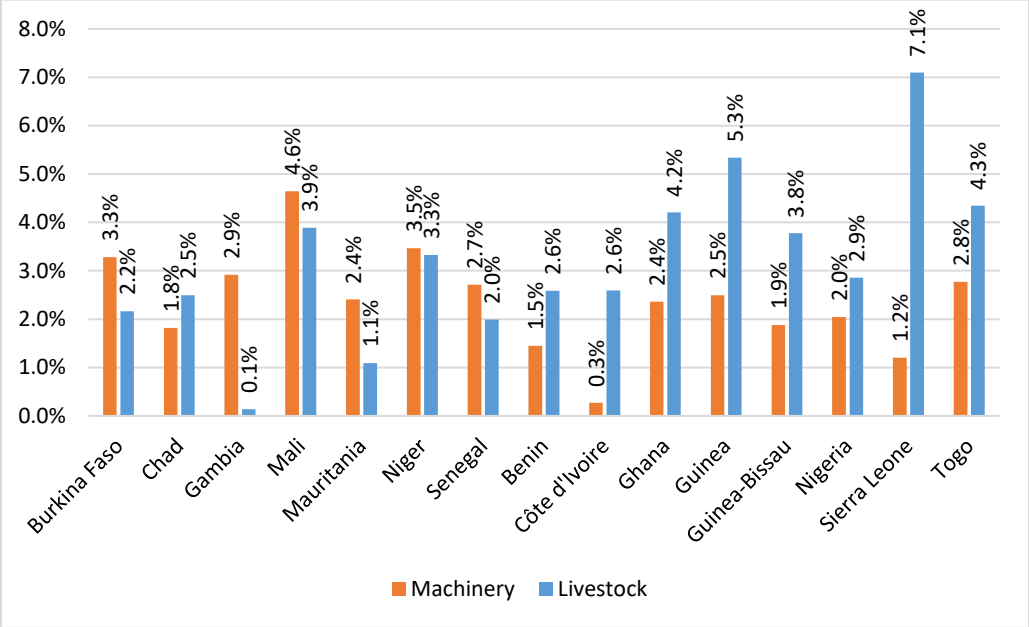
Source: Authors' calculations based on USDA, 2018.

Figure 26: The Gambia recorded one of the subregion's largest labor force growths in agriculture between 2001 and 2014



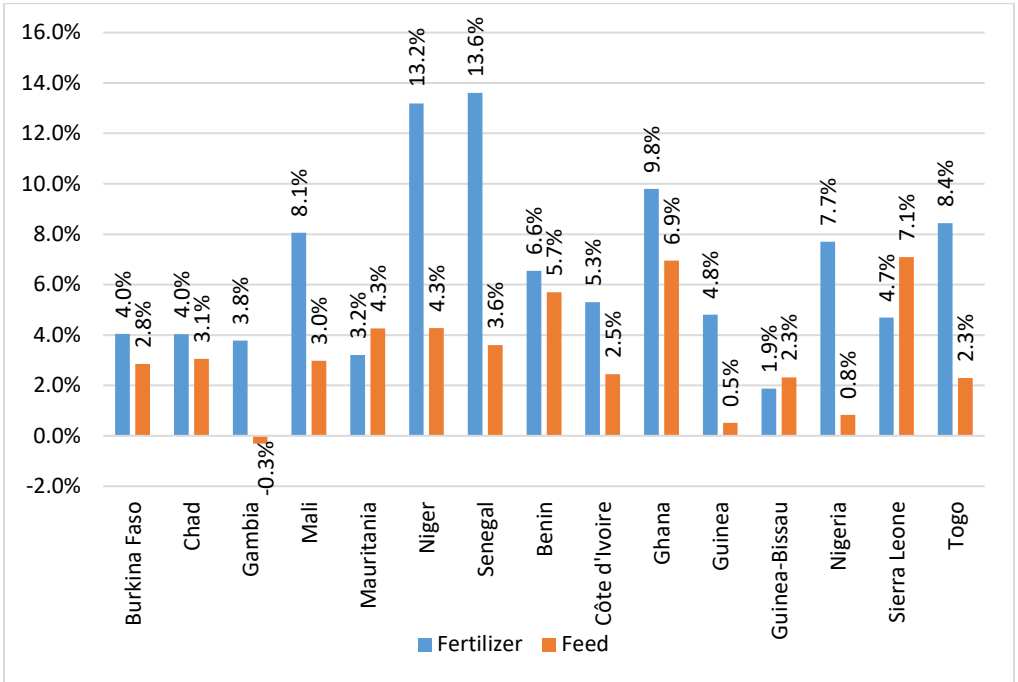
Source: Authors' calculations based on USDA, 2018.

Figure 27: Growth of agricultural capital inputs in The Gambia was relatively moderate between 2001 and 2014



Source: Authors' calculations based on USDA, 2018.

Figure 28: Unlike Other West African countries, use of animal feed as agricultural input declined in The Gambia between 2001 and 2014



Source: Authors' calculations based on USDA, 2018.

This decline is the result of several factors, including poor rainfall distribution, weak marketing infrastructure, a lack of access to agricultural inputs, and a limited resource base. Smallholder producers encounter numerous constraints that inhibit production and productivity. They generally have limited access to services, credit, and agricultural inputs such as fertilizers, pesticides, improved seedlings, and insecticides for improved production and productivity (Figure 28). For instance, in The Gambia barely 2 out of 10 crop producers use pesticides/insecticides in Gambia, 4 out of 10 use organic fertilizers, and 5 out of 10 use inorganic fertilizers (Figure 29). Although animal manure can provide a useful nutrient supply for growing crops, it only contains those nutrients present in the animal feed that composes the manure. The private sector is the main provider of these important agricultural inputs (Figure 30).

Figure 29: Farming methods are still traditional despite an encouraging adoption of inorganic fertilizer

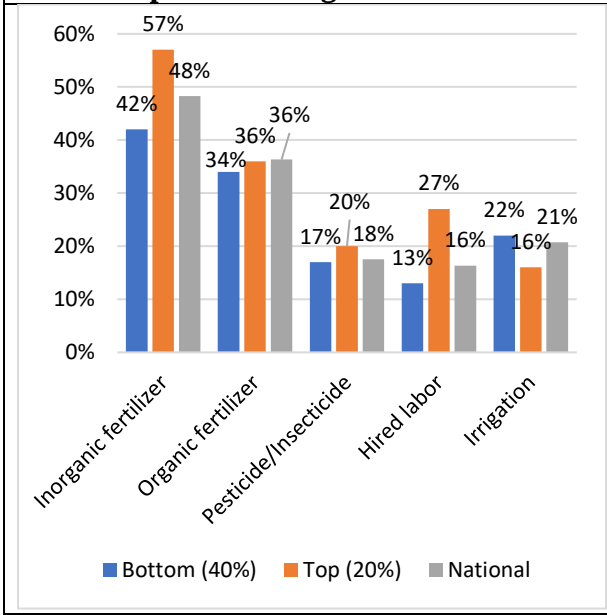
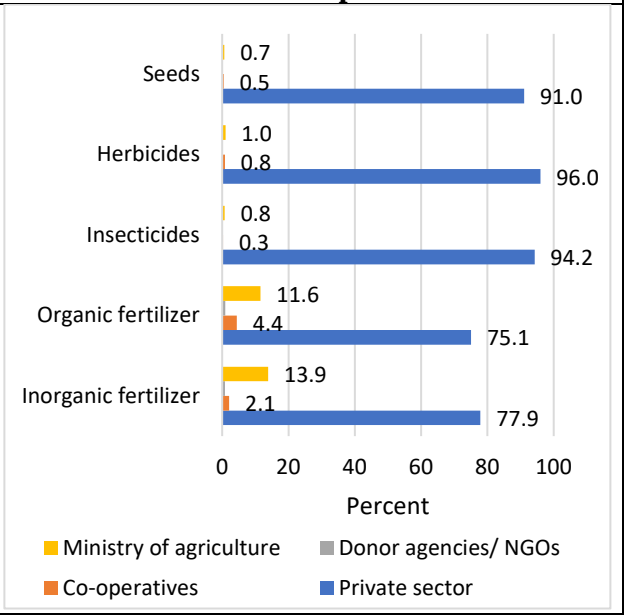


Figure 30: The private sector provides most of the agricultural inputs

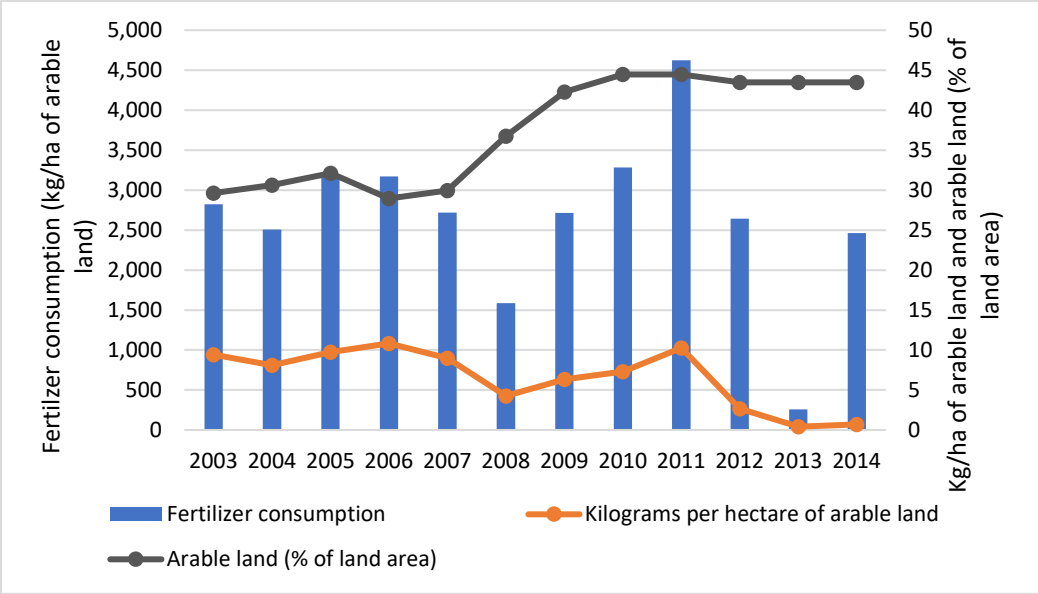


Source: Authors' calculations based on the IHS 2015/16.
Note: NGOs = nongovernmental organizations.

Increased agricultural productivity comes because of effective adoption of improved technologies. Fertilizer consumption measures the quantity of plant nutrients and is calculated as production plus imports minus exports, and arable land is land under temporary crops, temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land temporarily fallow. According to Wortman and Cummings Jr. (1978), regardless of holding size, four key requisites should be met to increase productivity: (a) improved farming system; (b) teaching farmers about new, improved farming methods and technologies; (c) a supply of inputs; and (d) an availability of markets. About 45 percent of the total land area is suitable for continuous crop

production. The supply of inputs is one of the most important for increased yields and is easily and quickly adopted by farmers. However, other factors are equally important as seen in 2014 where there was a high fertilizer consumption yet low yields—low soil fertility, irregular rainfall patterns, low-yielding seeds among other (Figure 31).

Figure 31: Fertilizer use is important for increased yield



Source: FAOSTAT.

Note: Fertilizer consumption is defined as the total consumption of the nutrients nitrogen, phosphate, and potash.

Crop producers are also confronted with inadequate marketing channels and storage equipment. These inadequacies often result in high postharvest losses. A lack of access to key infrastructure, such as all-season roads, food markets, and public transportation, prevents some farmers from transporting and selling their products, especially groundnuts and vegetables, which are the main crops grown for both subsistence and sale, as shown in table 2. In the regions of Kerewan, Kuntaur, and Janjangbureh, for instance, access to food markets can be extremely challenging for farmers wanting to sell their crops.

Table 2: Access to food market, all-season road, and public transportation (%)

	Banjul	Kanifing	Brikama	Mansakonko	Kerewan	Kuntaur	Janjangbureh	Basse	National
Food market									
<1 km	58.3	92.1	59.5	52.8	28.9	15.4	30.6	58.9	47.8
1-2 km	21.8	0.0	21.2	9.1	10.8	6.5	10.7	10.9	13.2
2-5 km	19.9	7.9	14.4	9.9	19.6	23.0	19.1	13.3	15.7
5-10 km	0.0	0.0	4.0	13.1	24.2	33.0	28.3	9.0	14.1
>10 km	0.0	0.0	1.0	15.1	16.6	22.2	11.4	7.9	9.2
All season road									
<1 km	100.0	84.5	75.7	64.7	72.5	49.8	39.2	79.4	69.6
1-2 km	0.0	7.6	12.5	11.2	9.6	11.7	9.2	8.5	10.4
2-5 km	0.0	0.0	6.8	19.0	6.1	16.1	20.5	6.8	9.6
5-10 km	0.0	0.0	4.1	4.1	6.5	17.4	21.1	4.4	7.2
>10 km	0.0	7.9	0.9	1.0	5.4	5.0	10.1	1.0	3.1
Public transportation									
<1 km	80.1	88.2	76.6	60.9	15.4	39.9	36.2	66.3	55.4
1-2 km	0.0	3.9	13.3	11.8	16.2	16.2	9.4	12.3	13.1
2-5 km	19.9	0.0	7.6	18.7	18.0	17.5	21.0	13.0	13.5
5-10 km	0.0	0.0	2.1	7.5	16.4	19.8	22.9	5.8	9.4
>10 km	0.0	7.9	0.4	1.1	34.0	6.6	10.4	2.5	8.6

Source: Authors' calculations based on the IHS 2015/16.

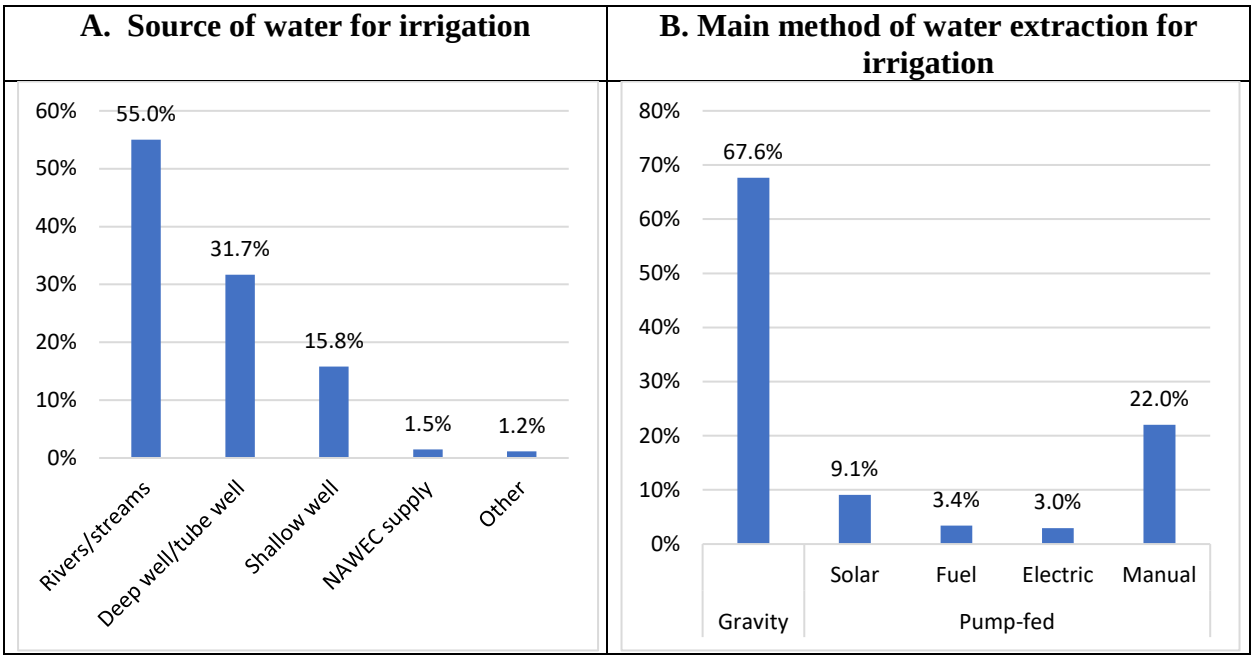
3. Vulnerability to Climate and Environmental Shocks

The sector is vulnerable to climate shocks, especially erratic rainfall distribution. Agricultural production in the country is highly dependent on rainfall. Since the Sahelian drought of the 1970s, total rainfall and distribution has been erratic, significantly affecting agricultural production. More than 98 percent of agricultural lands in The Gambia are rain fed, so a decline in rainfall (amount and distribution) and increased temperatures are expected to constrain productivity of crops such as maize, groundnuts, and millet. An analysis of long-term climate data shows that the past 50 years have seen a decrease in the total amount of precipitation and the length of the rainy season. Since rainfall is erratic, it is essential that farmers use quality drought-tolerant seeds as well as fertilizer and other production support inputs.

It is important for crop producers to practice irrigated farming and not rely solely on rainfall. The proportion of arable land equipped for irrigation has remained flat since 2010, at a low 1.1 percent. Unfortunately, as shown in Figure 32, only 6 out of 10 farmers practice irrigation; an irrigation that is mainly traditional. The amount of arable land under irrigation has remained relatively low in The Gambia. Rivers and streams are the main sources of water used by these rare farmers who practice irrigation. Gravity irrigation and manual pump-fed irrigation are the main methods used. One of the major obstacles to the development of agriculture in the country is the

lack of irrigation technology. Centrifugal water pumps, submersible water pumps, drip irrigation systems, and other irrigation fittings are good alternatives.

Figure 32: Irrigation practices among crop producers in The Gambia



Source: Authors' calculations based on the IHS 2015/16.
Note: *Fuel* refers to diesel, petrol, and kerosene.
NAWEC refers to National Water and Electricity Company

The sector is also challenged by other important environmental concerns, such as droughts and coastal inundation. The Gambia's location at the southern fringe of the Sahara desert makes it particularly prone to droughts. An analysis shows an increase in the length and frequency of extreme weather events such as droughts and dust storms. The indirect effects of droughts include increased forest and woodland degradation through frequent bush fires, changes in land use, and an overall reduction in biodiversity.

Coastal zones are particularly vulnerable to climate change. Key concerns include sea level rise, land loss, changes in maritime storms and flooding, and salinization of coastal water resources. This includes coastal settlements of The Gambia (Elasha et al. 2006). Rising sea levels could inundate wetlands and other low-lying areas, erode beaches, intensify flooding, and increase the salinity inland along the river and in groundwater tables. Although sea level will not rise suddenly, a 1 meter rise in sea level could submerge about 8.7 percent of The Gambia's total land area, which includes more than 61 percent of the current mangrove area and more than 33 percent of swampland, potentially creating new wetlands and mangrove areas.

Furthermore, the whole of Barra and more than 50 percent of Banjul—including Banjul Port, the country's only deepwater seaport—are at risk of inundation. Additionally, groundwater in the western part of the country is at risk of increased salinization, and coastal aquifers are in danger of diminishing, which would affect freshwater supplies and peri-urban agriculture. The impact of sea level rise and coastal erosion on the tourism and artisanal fisheries subsectors needs to be highlighted (Jaiteh and Sarr 2011).

The low-lying topography, combined with the country's dependence on rain-fed agriculture, inadequate drainage, erratic rainfall, and frequent droughts, makes The Gambia particularly vulnerable to climate changes that can potentially hamper agricultural growth.

In this context of vulnerability to environmental degradation, key actions are necessary to help agricultural households cope with climate changes and other environmental concerns. Figure 33 shows the main environmental concerns of households. Bush fires and erosion are the main constraints, and Figure 34 shows the strategies households adopt. Some of these actions include restructuring present irrigation systems; selecting drought-, pest-, disease-, and weed-resistant high-yielding crop varieties for the local conditions, including those that tolerate salinity; and developing an early warning system to inform farmers and other stakeholders of possible climate change and its impact on agriculture.

Figure 33: Environmental concerns of agricultural households

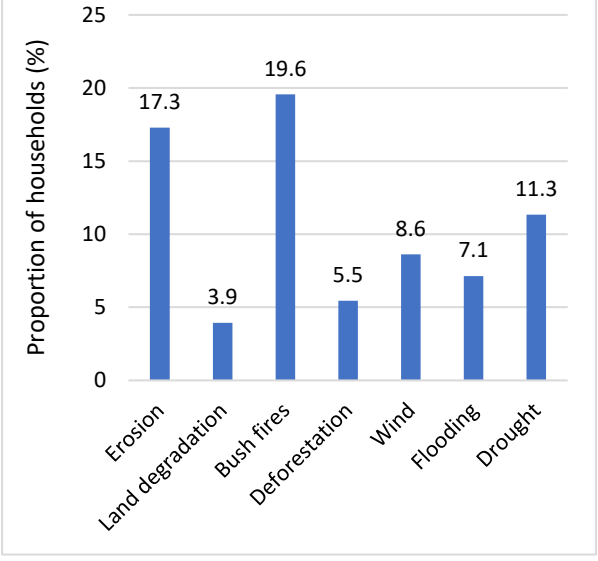
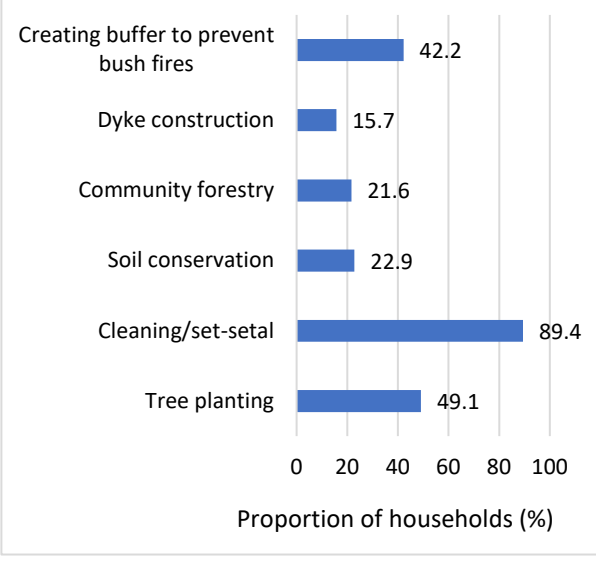


Figure 34: Strategies adopted to combat environmental problems



Source: Authors' calculations based on the IHS 2015/16.

4. Conclusion

Agriculture is the mainstay livelihood in The Gambia. The agriculture sector accounts for about 20 percent of the GDP and 75 percent of the labor force. For the period 2001–14, the country recorded one of the largest growths in the agricultural labor force for a West African country. The general performance of the sector has been fluctuating, with significantly low production and then bumper harvests. The share to GDP has continued to decline due to weather-related shocks. The 2014 National Contingency Plan ranked floods as the highest risk to livelihood (4.2), followed by droughts (3.8). The relationship between rainfall and agricultural production indicates a consistently negative effect on production, especially for small farmers. Furthermore, agriculture is an important source of household income—after salaries and petty trading—especially for rural households.

Poverty reduction efforts in The Gambia are hindered by the country's extreme vulnerability to climate-related risks and shocks. The country is extremely vulnerable to food insecurity due to weather-related shocks (droughts and floods). Weather shocks have adverse impacts on the macroeconomic performance and stability. But adverse shocks affect the rural population more than they do the urban population, and they result in heavy social and economic costs, such as the loss of lives and livestock and ruined crops. In addition, rice imports are a drain on the scarce resources, and rice production requires using new technology and intensifying production and management.

Low agricultural productivity is one of the key development constraints in The Gambia. These constraints include low levels of capital (both human and physical), poor farming practices, and limited access to markets and extension services. Output has been correlated with the use of fertilizers. Farming methods are still traditional, and modern inputs have remained relatively low. For instance, about 48 percent of farmers use inorganic fertilizers compared to 18 percent who use pesticides.

The Gambia's land resources are at risk of irreversible degradation. It is an undisputed fact that The Gambia's land resources are at risk of irreversible degradation under current land management and land-use practices.[4] The National Action Programme to Combat Desertification provides an opportunity for the country to take stock of existing measures and consolidate actions to combat land degradation in a more strategic and holistic manner. This land degradation, compounded with poor seeds and low use of fertilizers, makes agriculture productivity low. The importance of agricultural technology in enhancing production and productivity can be realized when yield-increasing technologies are widely used.

[4] The Ministry of Environment, Climate Change, Water, Forestry and Wildlife.

Irrigation remains an important source to food self-sufficiency. Irrigation technology is low, and this is one of the main constraints facing the agriculture sector. The Gambia can only meet about 50 percent of its food needs and crop yields are relatively low but with an estimated potential of 3–4 MT/ha for cereals and 6–7 MT/ha for rice. Local rice production accounts for a small fraction of the total rice consumption, and most rice is imported. The demand for rice will remain strong, and investment in rice irrigation and land-use management will be key to achieving food self-sufficiency. The cost estimates for installing irrigation systems vary from US$4,000/ha for tidal irrigation to US$10,000/ha for pump irrigation, which is beyond the reach of the poor population. However, the profit/cost ratio for tidal irrigation is 2.0, whereas pump irrigation is 0.72. Rather than the current low rice production, it is evident that The Gambia can increase rice output by using tidal irrigation. Although women play a critical role in household food production, their low land ownership prevents them from making land-use decisions. There is scant evidence of their participation in water management or policy decisions because only 8.6 percent of women own land.

Given the short rainy season and climate shocks, food demand will continue to rise. Large quantities of produce are wasted each year due to inadequate storage and handling facilities and a limited value added. For example, postharvest fish losses are estimated at 20–30 percent, yet traditional fish processing is an important source of food in the rural areas. The increasingly urban population (the urban population growth rate is over 4 percent) and the large tourism industry implies that the demand for processed food will increase, and the agriculture sector must diversify from traditional production to a well-integrated food chain with an agro-processing private sector using local food inputs. The processing plants could further offer employment during the off-season period.

Research into climate-adaptive crop varieties is required for The Gambia to be self-sufficient. The National Agricultural Research Institute (NARI) is the sole institution in The Gambia with a mandate to undertake crop research. NARI prioritizes crops based on their economic importance and potential to impact food security. It ranks crops in the following order of importance: groundnuts, early millet, rice, maize, cowpeas, sesame, sorghum, findi, and horticultural crops (tomatoes, eggplants, cabbages, and peppers, among others). Rice, millet, and groundnuts are the most important crops. Early millet is the earliest crop, maturing when food is scarce and other crops are not ready. Furthermore, rice is the staple consumed at an average of 117 kg per person. As a result, both rice and early millet are a priority for NARI.

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