

# Socio-economic impacts of sustainable development on agriculture in Morocco

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## Abstract

Morocco, the 5th largest African economy by GDP, largely depends on agriculture. The sector represents 35% of all employment, with 72% of rural employment. Considering agricultural vulnerability to climate change. Morocco is confronted with the increasing prevalence of drought. The study aimed to examine the socio-economic impacts of sustainable development on agriculture in Morocco by analyzing the existing literature to explore and provide up-to-date information about recent changes and trends. It concluded that the adoption of sustainable practices fostered productivity and reduced the volatility of value-added in agriculture. However, the main challenges are water scarcity and difficulty in the adoption of new practices due to the high illiteracy rate in rural areas 50.9% (2014).

**Keywords:** Sustainable development, agriculture, socio-economic, climate change, Morocco

**JEL classification:** O10, Q01, Q10

## Introduction

Morocco's economic situation as a developing country still depends to a disproportionate degree on agriculture, as agriculture is extremely vulnerable to changes in temperature, humidity, wind speed, and climate variation. One of the country's biggest challenges is the impact of climate change and the increasing prevalence of drought (Meliho et al., 2019). There is no denying the fact that sustainable development is the key factor for climate adaptation and mitigation. Therefore, Morocco has considered sustainability a path for its agricultural development mainly first via Green Morocco Plan (2008-2020), followed by Green Generation Strategy (2020-2030) (Elalaoui et al., 2021). The overall objectives of the review were to explore and examine the socio-economic impacts of sustainable development on agriculture in Morocco, including the evolution of the sector and the issues that impede its sustainability. Specifically, the study aimed to address the following research questions: What are the past trends and prospects for agricultural development strategies in Morocco, focusing on the current situation? What are the challenges that hinder the sustainability of this sector to deliver sustainable development? What are the perceived socio-economic impacts of sustainable development on agriculture? What are the applied and required adaptation actions, policies, and measures?

## *Theoretical background*

The impacts of climate change will have a disproportionately negative impact on developing countries such as Morocco (Tan et al., 2021). The populations of the developing world are more vulnerable as they are not prepared to withstand a deleterious impact, plus the lack of the necessary infrastructure to deal with such exigent situations, import dependence, and the difficulties in maintaining a stable macro economy (Filho et al., 2019; Tan et al., 2021). The

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global economic impacts are expected to be detrimental to many developing countries, even for the smallest increase in global average temperature (Stern, 2006). Some poor countries would likely suffer particularly severely, and climate change will exacerbate problems related to rapid population growth, existing poverty, and a heavy reliance on agriculture and the environment (Enete & Amusa, 2010; Seaman et al., 2014). In recent years, more developing countries opt for sustainable agriculture (López-Sánchez et al., 2021). Sustainable agriculture is identified as an integrated system of crop and livestock production practices that produce adequate amounts of high-quality food, protect its resources, and be both environmentally safe and profitable (Velten et al., 2015). As the negative impact of climate change led many smallholder farmers in low-income countries to adopt more sustainable agriculture approaches such as climate-smart agriculture practices, mainly of their cost efficiency (Nyang'au et al., 2021). Developing countries and particularly poor smallholder farmers are still vulnerable as a result of their lack of adequate adaptive capacity (Archer et al., 2007). However, sustainability in agricultural systems has improved food production and reduced food poverty in over fifty developing countries in Africa, Asia, and Latin America by adopting low-cost, and locally available environmentally sensitive practices and technologies (Pretty et al., 2003).

Climate adaptation and mitigation initiatives in Africa have taken shape in different international conferences, collaborations, and partnerships to promote the adoption of sustainable development practices, technologies, and solutions. As African countries are in the process of integrating the United Nations Sustainable Development Goals (SDGs) into their development plans. Morocco's awareness of the threat of climate change has prompted it not only to adhere to the 2030 Agenda for the Sustainable Development Goals but also to organize many international conferences, such as the Conference of the Parties COP 7 (2001) and COP 22 (2016). Since the agricultural sector is of strategic importance in Morocco, the country has also presented on the occasion of COP 22 (2016) the Initiative for the Adaptation of African Agriculture to Climate Change (AAA Initiative), which was supported by 38 African countries, and was recognized by the Heads of States of the African Union. The initiative fosters the implementation of concrete projects to improve agricultural water management, soil management, climate risk management, and financing capacities. In the context of the mentioned international cooperations and partnerships, Morocco has benefited from various international financial supports, such as Morocco Climate-Smart Agriculture Investment Plan from the World Bank and Food and Agriculture Organization (FAO) for the current decade to effectively support sustainable agriculture, boost productivity and achieve food security. The investment plan aims specifically to support the intensification of the most productive land, soil conservation to maintain longer-term fertility and conserve carbon, agro-forestry, integrated crop-livestock management, improved agricultural water management, erosion control, reducing the deforestation and reforestation to preserve watersheds, restoration of degraded lands and improved pest and disease management. Furthermore, these investment plans will promote the modernization and digitalization of the sector, such as the Agriculture 4.0 adoption plan (HCPM, 2023; World Bank, 2019; World Bank et al., 2018).

Notwithstanding the detrimental effects of climate change on both developed and developing countries, sustainable agricultural adaptation approaches that promote climate resilience have proven to be effective from both mitigation and socio-economic perspectives and would help steer economies on low-carbon and climate-resilient growth paths. Climatic change can cause significant economic damage, particularly in the agricultural sector, which depends on biodiversity, soil fertility, and water resources. For countries where agriculture accounts for a significant proportion of their economy, such as Morocco, climate change is a major challenge to their economic stability and development, as well as the quality of life and livelihoods of their inhabitants. The paper conducted a literature overview, resulting in an exploratory review

of sustainable agriculture's current state and its socio-economic impact in Morocco. To address the mentioned research questions, the existing literature had to be relied upon to provide a comparative analysis of the past and current trends, as well as the socio-economic impacts of sustainable development and the relevance of sustainable agriculture in Morocco. In addition, under the context of the socio-economic impacts of sustainable development on agriculture in Morocco, the results were organized under the three main subchapters: Economic, environmental, and social dimensions of sustainable development. Furthermore, it should be mentioned that the literature examined comes from three different languages: English, French, and Arabic.

### *Methodology*

In terms of the methodological approach used to review the previous studies, this paper can be categorized as a narrative review. The selected previous studies and findings were contrasted, summarized, and organized under three main subchapters to provide a clear view of the state of agricultural development in terms of sustainability and the socio-economic impacts of sustainable development in the light of changes, past and current trends. The academic journal articles related to this research area referred to in this paper are drawn from various sources and web search engines such as Google Scholar, and ScienceDirect. Including scientific papers that are considered to provide clarity and a new perspective on the subject matter. Given the nature of the topic, it was necessary to rely not only on the scientific articles published on the topic but also on official documents and reports released by different renowned sources such as the World Bank Group, Food and Agriculture Organization (FAO). In addition, the official documents, reports, and censuses provided by the state and government institutions were mainly included for their relevant information and statistics to help understand the past and current trends in agricultural development prospects. Another reason is the government's policy perspective for a better understanding of the topic.

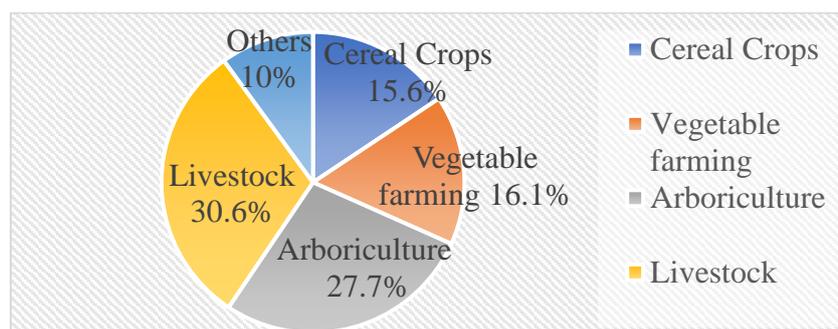
### **Findings**

Morocco is generally regarded as a country undergoing demographic, economic, and political transformation. The country has made significant efforts to promote its agricultural development, rendering the sector essential to its economic and social development. In addition, agriculture is crucial for the rural population who depend on it, its strategic dimension in terms of food security, and lastly its contribution to the regulation of the trade balance (HCPM, 2023). In the following, the results of the socio-economic impacts of sustainable development on agriculture review were organized into the fundamental pillars of sustainable agriculture: economic, environmental, and social dimensions.

#### *Economic dimension*

The agricultural development strategy in Morocco was a great success. Since, the Gross Domestic Product (GDP) from the average annual growth rate of agriculture doubled to +5.25% (2008-2018) relative to the previous decade's +2.5% (1997-2007), which was achieved primarily by promoting the development of modern agriculture especially the sustainable one, with high productivity and added value in the irrigated and relatively prosperous unirrigated lands that meet the market requirements, through private investment. And secondly, by providing support to small-scale agriculture, fostering the transition to practices and technologies that are deemed sustainable, and improving the incomes of the most vulnerable farmers, particularly in landlocked areas (HCPM, 2023).

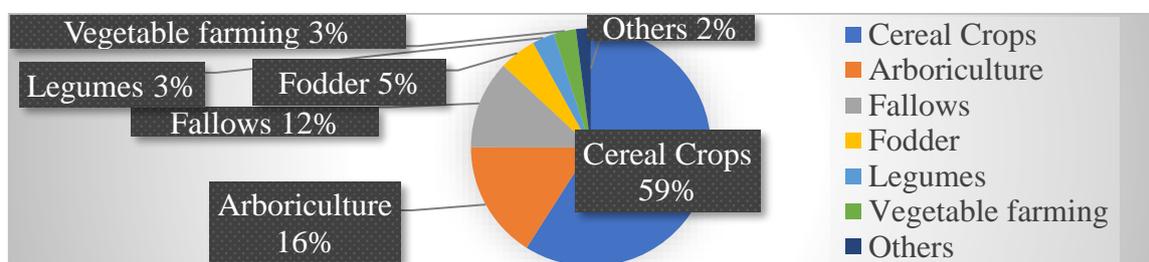
**Figure 1:** Structure of Value-added agriculture over the period 2008-2018 (in %)



Source: (HCPM, 2023)

Since 2000, the new agricultural strategies towards a better adaptation of agricultural production to the agroclimatic context, have changed the structure of the Value-added agriculture and were further emphasized within the framework of the Green Morocco Plan (2008-2020), to support high value-added agricultural production, such as arboriculture (27.7%), livestock (30.6%), and vegetable farming (16.1%). In addition, fostering the most resilient crops to climatic hazards in the sustainability context has reduced the volatility of value-added agriculture, measured by the standard deviation of agricultural growth, with significant attenuation between 1990-1999 and 2000-2018 by 61.8%. Moreover, promoting the conversion of cereal crops in areas of unfavorable conditions to other high value-added agriculture, intensification of production, and diversification of agricultural activities for more resiliency (HCPM, 2023).

**Figure 2:** Structure of agricultural lands in Morocco



Source: (HCPM, 2023)

Over the period 2008-2018, cereal production fluctuated between 33.5 million quintals recorded in 2016 and 114.7 million quintals in 2015. These variations led to a significant change in the share of cereal in agricultural value-added, which fluctuated from 21.4% in 2009 to 7.4% in 2016. Cereal crops, which occupy almost 60% of the total agricultural lands, are 90% practiced in rainfed areas. This concentration in the rainfed areas, especially at the level of the unfavorable rainfed areas, makes them more vulnerable to climatic hazards (HCPM, 2023).

**Table 1: Cereal Production in Morocco periods (2020,2021,2022)**

	2015- 2019 average	2019	2020	Change 2020/ 2019	2016- 2020 average	2020	2021	Change 2021/ 2020	2017- 2021 average	2021	2022 estimate	Change 2022/ 2021
	000 Metric ton			%	000 Metric ton			%	000 Metric ton			%
Wheat	5,868	4,100	2,560	-37.56%	4,765	2,560	7,540	194.53%	5,712	7,540	2,500	-66.84%
Barley	2,099	1,161	640	-44.87%	1,548	640	2,780	334.37%	1,981	2,780	690	-75.18%
Maize	101	41	50	21.95%	92	50	100	100.00%	82	100	30	-70.00%
Others	99	95	105	10.53%	99	105	93	-11.43%	102	93	98	5.38%
Total	8,167	5,397	3,355	-37.84%	6,504	3,355	10,513	213.35%	7,877	10,513	3318	-68.44%

**Source:** FAO, 2021, 2022. *Percentage Change: %Increase = Increase/Original Number × 100*

For instance, the 2020 and 2022 harvests are among the lowest recorded in the last 20 years, as they were characterized by poor rainfall in terms of amount and distribution. The cereal production of these two years decreased about 60 percent relative to the previous five-year average and 38% to 70% below the prior year's harvest. In contrast, the 2021 cereal production exceeded the five-year average by over 60 percent. The season was characterized by favorable rainfall, the precipitations were adequately distributed over time and space to facilitate sowing and early crop development. However, it has been shown that the conversion of rainfed land from cereal crops sensitive to climatic variability to arboriculture enhances climate resilience and improves productivity, especially arboriculture of fruit trees. Whereas in the field, farmers' practices show that it is the production systems that have evolved to combine arboriculture with cereals as an intercropping agriculture system which is considered a sustainable farming practice (FAO, 2021, 2022; HCPM, 2023).

**Table 2: The absolute poverty rate and vulnerability to poverty rate in Morocco (in%)**

		2013	2019
Absolute poverty	Urban	1.6%	0.5%
	Rural	9.5%	3.9%
	Total	4.8%	1.7%
Vulnerability to poverty	Urban	7.9%	4.6%
	Rural	17.4%	11.9%
	Total	12.5%	7.3%

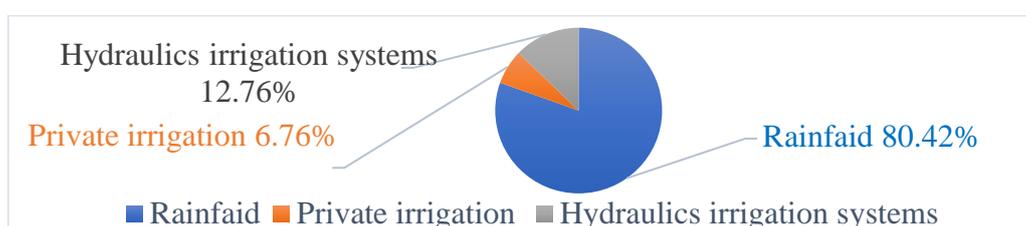
**Source:** (HCPM, 2023)

Agricultural prosperity, which was achieved thanks to the government's agricultural strategies, and the promotion of various sustainable practices and technologies, contributed to the substantial decrease in absolute poverty and the vulnerability to poverty rates in rural areas. Absolute poverty in rural Morocco has reduced by over 5% between 2013 and 2019. In addition, rural populations' vulnerability to poverty decreased to 11.9% in 2019. The government has introduced plans to support the newly emerging middle class of farmers in rural communities, including access to domestic and international markets (HCPM, 2023).

### Environmental dimension

Environmentally, Morocco holding 7th rank in Climate Change Performance Index (2023) has promoted sustainable agricultural practices in agriculture including the wise use of water resources for irrigation, soil conservation, and the use of renewable energy (Jan Burck et al., 2022; Maatala et al., 2020). Additionally, smallholders, who represent 70% of farms still rely on traditional agricultural practices that have proven to be sustainable for soil conservation such as natural fertilizer (e.g.: manure), crop rotation, and agricultural water reuse. These sustainable traditional practices gained the support of the state. Furthermore, Morocco's agricultural development strategy has encouraged other sustainable practices such as crop diversification, and drip irrigation over traditional surface irrigation for more efficiency, which currently covers 592,091 ha with a previous ambition to convert 710,000 ha to drip irrigation, and the conversion to agriculture that are resilient to climate hazards (HCPM, 2023).

**Figure 4:** Distribution of agricultural land depending on the type of irrigation (2019-2023)



**Source:** (HCPM, 2023)

Climate variability and change are putting increased pressure on agriculture. a strong decline in precipitation was perceived since 1980 (-15% to -20%) with the decline in river runoff (-30% to -40%), water resources availability is already under severe pressure with experienced rain deficits since 2015. As the irrigated land occupies only 19.58% of the cultivated area, representing about 1.8 million ha, the crop production that's primarily rainfed 80.42% is highly vulnerable to increased rainfall variability, particularly barley and wheat. As a result, the unirrigated areas are the dominant cultivated lands. This predominance of rainfed land increases the agricultural sector's vulnerability to climate change and variations and negatively affects crop yields. Furthermore, irrigated agriculture is also impacted as the water needs for these crops can increase from 7% to 12% due to rising temperatures and evapotranspiration (HCPM, 2023).

**Table 3:** Morocco's main dams filling rate as of December 14 (2016-2022)

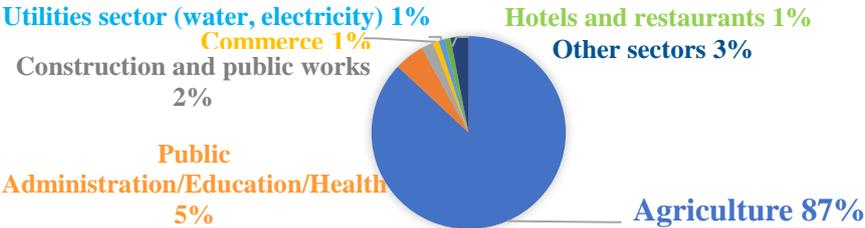
	2016	2017	2018	2019	2020	2021	2022
The normal capacity of dams (Mm3)	15,212.2	15,212.2	15,137.3	15,597.0	15,597.2	16,122.6	16,122.6
Dams reserve (Mm3)	7,705.0	5,342.4	9,499.9	7,272.1	5,666.2	5,555.2	4,121.7
Filling rate (%)	50.65%	35.12%	62.76%	46.62%	36.33%	34.46%	25.56%

**Source:** (HCPM, 2023)

Considering the serious and negative impacts of future climate change, the country could fall far below the "extreme level of water scarcity" in the coming decades. Since the sudden change in precipitation occurred around 1980, the annual availability of surface water has already been

drastically reduced. The last year the country has marked the worst drought in decades, with annual rain deficits experienced in recent years. These successive years of drought have resulted in chronic shortages leading to a reduction in the supply of water to dams that is reflected in the decrease in the main dams' filling rate over the last seven years shown in the table, with dwindling groundwater reserves. As the groundwater is extracted well beyond the level of sustainable abstraction. In this respect, Morocco was classified by the World Resources Institute as a country with high water stress in 2010 and extremely high water stress in 2040. The ongoing decline in the availability of water resources is exacerbated by the deterioration in water quality due to inadequate wastewater treatment, diffuse agricultural pollution, and the loss of regulated reservoirs volumes caused by sedimentation. Since Morocco ranked 22nd as a high water-stressed country by the World Resources Institute (2019), a National Program for Drinking and Irrigation Water Supply (2020-2027) was implemented to address these circumstances, by building new dams and increasing the volume of wastewater collection, treatment, and reuse. While the annual volume of wastewater produced is projected to reach 900 million cubic meters annually by 2030. The wastewater treatment rate increased to 56% in 2020 compared to 7% in 2006. Since the volume of wastewater collected has increased sharply over the last few decades, the National Plan for Shared Sanitation and Reuse of Treated Wastewater, which was launched in 2018, aims to replace the National Sanitation Program (2005), National Program for the Reuse of Sewage, and the National Rural Sanitation Program (2013). It is also worth noting that Morocco currently has 149 dams, totaling 19.3 billion cubic meters, and five under construction via the National Program for Drinking and Irrigation Water Supply 2020-2027 (HCPM, 2023).

**Figure 5:** *Distribution of annual direct water consumption by sector (2020)*



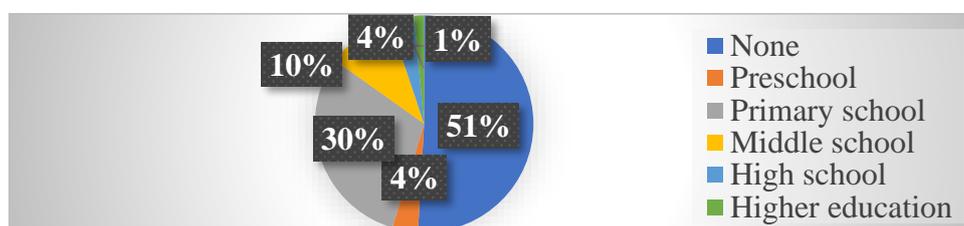
**Source:** (HCPM, 2023)

The present situation relating to water shortages has severe repercussions for the agricultural sector. Since the data on direct water consumption revealed that the amount of water consumed by the primary sector, for the most part, the agriculture sector (87%), is much greater compared to the industrial and service sectors' water consumption. As the water consumption is approximately 9 billion cubic meters per year, the subsequent sectors consume only a fraction limited to about 1.28 billion cubic meters. These statistics indicate that agriculture is the largest user of water resources in Morocco (up to 87.8% of total water consumption). Additionally, the Intergovernmental Panel on Climate Change (IPCC) climate projections for precipitation and average temperatures show that between 2010 and 2050, aridity is gradually increasing in Morocco due to the 11% decrease in rainfall and the increase in temperature of 1.3°C. Increased aridity has negative impacts on agriculture. The irrigation water availability will decrease by up to 25% at the reservoir level. Reduced yields of non-irrigated crops by up to 10% in some regions. And the decline in animal production due to negative impacts on crop production and declining water resources (HCPM, 2023). With all the factors and challenges mentioned, water shortages are one of the key issues facing agriculture over the next decade.

### Social dimensions

One of the major socio-economic impacts of sustainable development via agriculture strategies is the reduction of rural poverty through agricultural prosperity, encouraging a stable income for smallholders in rural areas based on sustainable agriculture technologies and practices, and fostering the emergence of a new middle class of farmers. However, given the high illiteracy rate of 50.9% (2014) and low adoption of technologies, the rural population is unprepared to contribute to the modernization of the sector. Even though agriculture still plays a major role in the socio-economic development of rural Morocco, smallholders that represent 70% of farmers are often unable to implement new practices and technologies leading to insufficiently rationalized water resources management, low irrigation efficiency, and low adaptive, productive capacity. Thus, sustainable development in agriculture is still impeded by its social dimension.

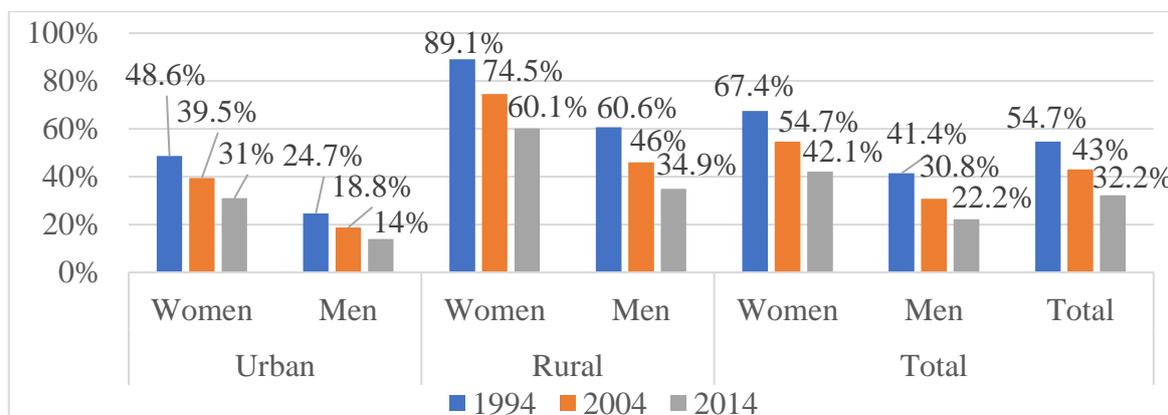
**Figure 6: Rural Level of education 2014 census (%)**



Sources: (HCPM, 2023)

The official figure for the country's illiteracy rate is 32.2% (2014) instead of 36.9%, this difference is because government institutions distinguish between those who have attended primary school (for children between seven and thirteen years of age) but did not graduate or quit with those who have never attended school. Thus, the rate drops from 36.9% to 32.2% of the total illiteracy in the country. Rural areas have the highest percentage of illiteracy in the country, at 50.9% (2014). It should also be mentioned that education is compulsory for Moroccan children of both sexes (since 1963) from the age of seven until they reach the age of thirteen, under the law No. 1-63-071 in 1963 (HCPM, 2023).

**Figure 7: Illiteracy rates based on gender and place of residence in (%) (Population aged 10+)**



Source: (HCPM, 2023)

The chart developed from the results of the last three government censuses shows that the rate of illiteracy is much higher in rural areas than in urban areas for both sexes. For instance, the

men illiteracy rate in rural areas was 34.9% in 2014, almost double and a half compared to 14% in urban regions for the same year. The same observation can be made for rural women (60.1% in 2014) compared to their urban counterparts (31% in 2014). The limited access to institutions such as rural schools may account for this disparity. Furthermore, the women's illiteracy rate is the highest, regardless of the place of residence. Mention should be made of the fact that in Morocco, population censuses are carried out every decade, and the next census is expected to be conducted in 2024 (HCPM, 2023).

## **Conclusion**

The paper provides insight into the current state of agricultural development of Africa's fifth-largest economy in the context of sustainable development with a comparative analysis of past and recent trends. The agriculture sector is still prominent for the country's economic growth as a developing country (13% of total GDP). In terms of the economic impact, the increase in GDP from agriculture's average annual growth rate could not be achieved without fostering the diversification of the sector and the promotion of crops that are more resilient to climate hazards. However, the sector remained for a long time little diversified with a high predominance of cereal crops (about 60% of total farmland), which makes it less resilient to climate change, exposes it to high volatility of growth, and negatively impacts economic growth. Environmentally, sustainable practices positively impacted agriculture, such as sustainable water practices, including the traditional ones for soil conservation. However, climate change will have an adverse impact on Morocco's agricultural development (Meliho et al., 2019). As a result, sustainable agriculture practices will likely become the core of the current and future agriculture development strategies to adapt to the future climate scenarios projection. Nevertheless, water shortage is still a threat to the future. Socially, agricultural prosperity resulted in significant part thanks to adopting sustainable practices and solutions, has reduced rural poverty, and will foster the emergence of a new middle class of farmers. However, the current high illiteracy rate and low adoption of technologies render implementing new practices and technologies challenging, leading to low irrigation efficiency, poor adaptability and productive capacity. The paper examined the key challenges facing the sector to deliver sustainable development. It was concluded that sustainable development in agriculture can only be achieved with its social and environmental dimensions. The discussed positive socio-economic impacts of sustainable agriculture practices will promote further discussion on resolving the mentioned challenges affecting agriculture development in Morocco and could serve as a reference and a steppingstone for future research relating to sustainable agriculture in the region.

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