Eurasian Journal of Agricultural Research 2023; Vol:7, Issue:2, pp:101-108

The Challenges and Prospects of South Sudan Agriculture

Musa KOSE[*], Kuyu KONGAS

College of Natural Resources and Environmental Studies, University of Juba, Juba, South Sudan.

[*]Corresponding author: musakose053@gmail.com

[*]ORCID: 0009-0009-2679-6784

Abstract

The South Sudanese agricultural sector is characterized by a subsistence-based approach, low productivity, a lack of infrastructure and market institutions, low levels of technology and inputs, and a high degree of rainfall sensitivity. Specifically, rain-fed subsistence agriculture and complete reliance on forests as a source of energy and other environmental goods and services are two factors that contribute to 95% of the population's dependence on climate-sensitive natural resources. In order to increase South Sudan's overall economic well-being, the agricultural sector's productivity performance is crucial. In the past, there have been several factors that have limited agricultural productivity, including a lack of improved or hybrid seed availability, a lack of seed multiplication capacity, low fertilizer profitability and efficiency, a lack of irrigation infrastructure development, a lack of transportation infrastructure, market accessibility issues, and a high prevalence of soil degradation and infertile soil. The aim of this review is to examine the challenges and risks facing the agriculture sector and the future prospects in South Sudan.

Keywords: South Sudan, Challenges, Prospects, Agricultural Production

Review article
Received Date: 3 October 2023
Accepted Date: 18 October 2023

INTRODUCTION

Agriculture is the main source of income for the majority of the population in Africa, with 75% of them living in rural areas. Thankfully, during the past few years, agriculture in Africa has continued to expand. However, area growth rather than advances in land productivity have been the main drivers of growth. In most nations, future sustainable agricultural growth will necessitate a larger focus on productivity increase as available space for new agriculture shrinks, especially in light of mounting worries about deforestation and climate change (Bekabil, 2014; Bağdatlı and Bellitürk, 2016a).

One of the most impoverished regions is Sub-Saharan Africa. It is about three times as big as the USA, both in terms of population and land area. Agriculture, which employs two-thirds of the labor force, generates 35% of the region's gross domestic product, and generates 40% of its foreign exchange profits, is crucial to the region's economies. Thus, increasing general economic well-being in Sub-Saharan Africa depends on improving productivity performance in the agriculture sector (Fulginiti et al., 2004).

Agricultural production and proximity to urban markets are substantially associated in Sub-Saharan Africa SSA, even after taking into account agro ecology. Inadequate resource endowments, insufficient input use (fertilizer, improved seeds, and irrigation), and unfavorable policies that persisted for a long time have been recognized as the main factors in the agricultural sector's poor and falling performance in SSA. Agriculture in Africa faces resource constraints due to ongoing environmental degradation, rapid population growth, and low levels of infrastructure investment (Dorosh et al., 2012). According to Moyo et al. (2015), Africa's low irrigation use and disproportionate reliance on rain-fed agriculture are to blame for the region's low agricultural production. Unirrigated crops like maize, cassava, millets, sorghum, yams, sweet potatoes, plantains, and rice serve as the region's principal food sources. Additionally, the lack of proper institutional support and a favorable business environment due to the agricultural sector's low public funding has made it difficult for the private sector to participate in and invest in agriculture. According to the Comprehensive Africa Agriculture Development Program (CAADP) of the New Partnership for Africa's Development (NEPAD), governments should allot 10% of their national budgets to agriculture in order to support water management, intensify irrigation, lessen the reliance of the continent on rain-fed agriculture, and boost climate change resilience. Public spending on agriculture, however, is significantly below the 10% target, ranging, for instance, from a low of 0.15% in Guinea-Bissau to 3.61% in Malawi (Shimeles et al., 2018).

After being founded on July 9, 2011, South Sudan is the world's newest nation. A January 2011 referendum that declared secession from Sudan resulted in the declaration of independence. The country is divided into six agro-ecological zones from a geo-morphological perspective, each of which offers a variety of agricultural possibilities (maize, sorghum, wheat, and so forth), as well as an abundance of water resources, including rainfall, lakes, and rivers. The production of cereal rarely fulfills demand, despite this potential. A severe output limit and decreased yield are caused by the low quality of productive inputs and support services, outdated and inefficient technology, and eventually the lack of infrastructure (Caruso et al., 2017).

Because rain-fed agriculture is highly dependent on the climate, which has a significant impact on agricultural production (Nasreldin and Elsheikh, 2022; Bağdatlı et al., 2015). Additionally, just 5% of the 30 million hectares of fertile land in the nation are actually harvested. In fact, more than a third of South Sudanese experienced moderate to severe food insecurity in 2010, with severe child acute malnutrition accounting for around 13% of those cases (World Bank, 2013). The distribution of rainfall within a season as well as its overall seasonal amount can both have an effect on agricultural productivity (Bağdatlı and Bellitürk, 2016b). Crop output is most adversely affected by droughts with extremely low total seasonal quantities (Elsheikh et al., 2022a). However, more minor intra-seasonal fluctuations in rainfall distribution during the growing seasons of crops, without a change in the overall seasonal amount, can still result in significant yield losses (Elsheikh et al., 2022b; Bagdatlı et al., 2023). This means that the overall number of wet days throughout the year is not as significant as the number of rainy days during the growth season. The aim of this review is to examine the challenges and risks facing the agriculture sector and the future prospects in South Sudan.

AGRICULTURE in SOUTH SUDAN: CHALLENGES and PROSPECTS

South Sudan is a landlocked nation with authority over 96% of the Nile River Basin in East-Central Africa. The Democratic Republic of the Congo (DRC), Uganda, and Sudan are its northern neighbors. Ethiopia, Kenya, and the Central African Republic are its eastern and western neighbors.

Latitudes 3.5° and 12° North and longitudes 24° to 36° East define the tropical region in which South Sudan is situated. 658842 km2 is the total area. The whole country is covered with expansive grasslands, wetlands, and tropical forests. Among its natural resources are significant ones for forestry, agriculture, mining, water, wildlife, and energy (Jubek et al., 2019). In sub-Saharan Africa, the country has one of the lowest population densities, with fewer than 13 people per square kilometer. In the northern desert zones, seasonal agriculture, pastoralism, fishing, and hunting are the main sources of income. Numerous options for a living are available in the nation's low, forested savannahs. The three areas (formerly historic provinces) that make up the country are Bahr el Ghazal in the northwest, Equatoria in the south, and Greater Upper Nile in the northeast. There are currently thirty-two states in the nation instead of the initial ten (MOE, 2015).

Due to its enormous acreage and favorable agro-ecological conditions, South Sudan has tremendous potential for sustainable agricultural growth. Prime agricultural land makes up more than half of the entire land area, while the remaining 50% is made up of marginal agricultural land, forests, mountains, rivers, and wetlands. South Sudan has a total land area of around 658,842 km^2, of which 27,712 km^2 are cultivated. The yearly rainfall in a large portion of the nation is sufficient for growing a variety of crops. Rainfall varies by location, ranging from 500 mm annually in the north, where a growth season of 100–150 days is provided, to roughly 2000 mm in the southwest, where a growing season of 150–250 days is provided. Thanks to several permanent large and small rivers, seasonal rivers, and underground water reservoirs, irrigated agriculture has tremendous potential. There are also vast swamplands that could be used for elaborate plans to produce sugarcane and rice (Ministry of Agriculture, 2012).

Prior to 2011, the Food and Agriculture Organization of the United Nations estimated that Sudan's total water withdrawal was roughly 27,590 million m^3 in 2005. With 26,150 million m^3, agriculture accounted for the vast majority of water use. 1,140 million m^3 of withdrawals came from municipalities, whereas 300 million m^3 came from industry. In order to estimate the water use in South Sudan after that year, the Food and Agriculture Organization used data for Sudan from before 2011 and assumed the following assumptions: the same amount for both South Sudan and Sudan combined; no substantial changes had occurred. Prior to 2011, the population of South Sudan was 17% that of Sudan, and the vast majority (75%) of industries (especially those in the petroleum sector) are located in Sudan. After 2011, it is expected that surface and groundwater extraction (primary and secondary) will be about 658 million m^3/year, or about 1.3% of the total renewable water supply, with agriculture using the most water and an average annual withdrawal of 60 m^3/year (Musa and Kongas, 2023). The less precipitation has an impact on ecosystem life. The most variable climate factor, in terms of time and place, among the climate parameters is the amount of precipitation (Bağdatlı and Arslan, 2020; Elsheikh, 2021).

Although the South Sudanese government is gradually enforcing water management policies and regulations, it is incredibly challenging to provide water facilities, services, and infrastructure in a way that is both effective and affordable because of the ongoing conflict, low population densities, and widely dispersed villages and towns (Jubek et al., 2019). Due to factors including scarcity of water, population increase, environmental degradation, and unintentional irrigation in agriculture, water resource management is becoming more and more crucial (Bağdatlı and Arıkan, 2020a; Bağdatlı and Ballı, 2019). This reflects the importance of the development and mechanization of agriculture in South Sudan.

Up to 95% of South Sudanese people are dependent on farming, herding, or fishing, according to the Food and Agriculture Organization of the United Nations. Any disturbance to this industry has repercussions that could hurt South Sudan's broader economy. Food insecurity has gotten worse as a result of sharp price increases brought on by soaring inflation, stifled markets and commerce, and low food production as a result of armed conflict or natural catastrophes (FAO, 2016). Traditional subsistence agriculture predominates in the Republic of South Sudan, where crop production and animal husbandry are the main sources of income for around 78% of households. Farmers rely on conventional farming methods and rain-fed agriculture. This combination makes them particularly vulnerable to climate change, especially unpredictable rainfall. Unfavorable meteorological circumstances, such as yearly flooding and recurrent droughts, reduce the output of crops and livestock. Flash floods in South Sudan's low-lying areas, especially those near the Sudd and Marcher wetlands and the White Nile, have destroyed trees, but droughts are also hastening the spread of the desert (Jubek et al., 2019). For this reason, it is anticipated that the Republic of South Sudan will experience similar developments.

Despite the variety of crops grown, South Sudan's agricultural industry is still mostly traditional and has low yields. For instance, it is well known that, in the cereal subsector, the vast majority of farmers do not employ high-yielding crops, synthetic fertilizers, or herbicides. The average yield of South Sudan, which ranged from 2005 to 2009, was just 0.97 tons per hectare, which is significantly less than the average yield of Egypt, where the majority of the cereals are grown under irrigation, which was 7.64 tons per hectare. These poor cereal yields in South Sudan are the result of numerous issues smallholder farmers face. The three main issues were pests and agricultural diseases, a lack of seeds, and irregular rains (South Sudan, 2013).

The main factors affecting the average distribution of precipitation are the effects of surface topography, atmospheric circulation patterns, and moisture availability (Bağdatlı and Arslan, 2019; Bağdatlı and Arıkan, 2020b). The first two of these characteristics are affected by temperature (Bağdatli and Can, 2020). Since the 1980s, the amount, intensity, frequency, and kind of precipitation have all altered, demonstrating that changes in temperature brought on by people are changing precipitation patterns (Elsheikh, 2021; Bağdatli and Can, 2019; Afreen et al., 2022). The earth's soil layer is essential for sustaining plant life, providing mechanical support, and supplying water and nutrients (Bağdatlı and Ballı, 2020). During the day, energy is captured by the soil and released as heat at night (Bellitürk and Bağdatlı, 2016). A crucial but insufficient need for the sector's effective development is the presence of arable land and a suitable climate. South Sudan must be able to ease the development of crucial off-farm infrastructure.

Production of crops in the current state, depending on the agro-ecological zone, South Sudan grows a wide variety of food and commercial crops. The area with the greatest potential for sustainable crop production is the Green Belt zone with the highest average yearly rainfall. Casava, sorghum, groundnuts, sesame, maize, finger millet, beans, pigeon peas, and vegetables (onions, okra, tomatoes, cabbage, eggplant, cucumber, and pumpkins) are among the crops. Citrus, pineapple, mango, banana, plantains, and other fruits are also grown. Other crops include papayas, yams, and sweet potatoes, which are raised for both domestic consumption and market sale (South Sudan, 2013). South Sudan has the capacity to become a significant exporter of cereals while also being self-sufficient domestically. However, the main obstacles to realizing this potential are mostly internal and, as a result, are under the control of policymakers: minimal use of the available arable land, low and declining productivity caused by inefficient farming practices, high marketing margins brought on by inadequate infrastructure, and proliferation of taxes (South Sudan, 2013).

In general, the South Sudanese food deficit can be reduced by addressing the structural issues that lead to low agricultural productivity, such as infrastructure improvements, the provision of agricultural services, institutional strengthening, and the adoption of well-thought-out policies and regulations. Other interventions will include bettering the land use and tenure system, using natural resources wisely, having suitably skilled human resources, and organizing rural communities (Ministry of Agriculture, 2012). Approximately 695 thousand tons of cereal were produced net (i.e., less a 20% post-harvest loss), while 885 thousand tons were consumed, resulting in a 200 thousand-ton import. The deficit not only poses a significant threat to food security, but it also increases the likelihood that external and fiscal balances will deteriorate, leading to a rise in the need for food aid and obstructing sector development (Figure 1) (South Sudan, 2013). By expanding the area under cultivation and improving productivity, it is possible to increase the output of cereals and other crops in South Sudan.

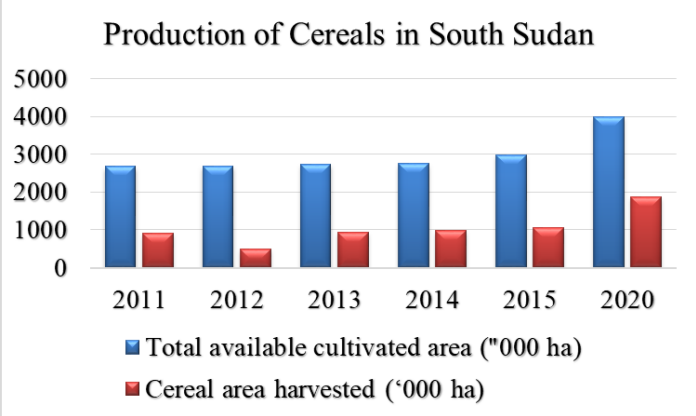

Figure 1. Production of Cereals in South Sudan

Despite the country's natural resources in terms of land and water, its agricultural industry is operating at a significant fraction of its potential and generating at levels that are much lower than those of its less endowed neighbors. Attracting high-impact foreign direct investment and connecting it to the nation's smallholder farmers and farmer cooperatives are necessary for the country to accomplish an export-led agricultural transformation and growth. Additionally, given the significance of cereals in the population's diet, the cereals industry needs to be at the forefront of initiatives to improve the traditional sector and lay the groundwork for a competitive performance in export markets (South Sudan, 2013).

According to the South Sudan Development Plan's Economic Development Pillar, small-scale private, primarily family-based agriculture and livestock industries have the greatest potential for initial new growth (Ministry of Agriculture, 2012). Therefore, there is a need to attract foreign direct investment in South Sudan while taking advantage of the experiences of other countries in order to promote the agricultural sector.

RECOMMENDATION and CONCLUSION

As a significant supplier of raw resources, food, and foreign currency, agriculture continues to be an important component of the economy in South Sudan. The majority of the labor force is employed there, and it might be used to diversify the economy. However, no thorough research has been done to explain how this sector's output relates to food security. Because agriculture in particular has been ignored, the issue has gotten worse.

The expansion of South Sudan's agriculture has also been uneven. According to research, the vast majority of South Sudanese are said to experience food insecurity. The South Sudanese agricultural sector is characterized by a subsistence-based approach, low productivity, a lack of infrastructure and market institutions, low levels of technology and inputs, and a high degree of rainfall sensitivity. The South Sudanese agricultural sector is mostly focused on low-yielding, rain-fed agriculture, where the outcome of a harvest is greatly influenced by the amount of precipitation, whether negative or positive.

South Sudan's low availability of improved or hybrid seed, capacity for seed multiplication, and low profitability and efficiency of fertilizer use due to a lack of complementary improved practices and seed are the main factors limiting agricultural productivity. Adopting better techniques is less profitable when there is a lack of market access and transportation infrastructure. In order to advance the agricultural industry, it is necessary to draw in international investment while also benefiting from other nations' experiences. Additionally, by enlarging the farmed area and raising output, the construction of essential non-agricultural infrastructure must be made possible in South Sudan.

REFERENCES

Afreen M., Ucak İ. & Bagdatli M.C. 2022. The analysis of climate variability on aquaculture production in Karachi of Pakistan. *International Journal of Engineering Technologies and Management Research.* 9(8): 16–23.

Bağdatlı M.C. & Arslan O. 2019. Evaluation of the number of rainy days observed for long years due to global climate change in Nevşehir/Turkey. *Recent Research in Science and Technology Journal*, *11*: 9-11.

Bağdatlı M.C. & Bellitürk K. 2016a. Water resources have been threatened in Thrace region of Turkey. *Adv Plants Agric Res*, *4*(1): 227-228.

Bağdatli M.C. & Can, E. 2019. Analysis of Precipitation Datas by Mann Kendall and Sperman's Rho Rank Correlation Statistical Approaches in Nevsehir Province of Turkey. *Recent Research in Science and Technology Journal,(11)*:*24*-31.

Bağdatli M.C. & Can E. 2020. Temperature Changes of Niğde Province in Turkey: Trend analysis of 50 years data. *International Journal of Ecology and Development Research (IJEDR)* 6(2): 62-71.

Bağdatlı M.C. & Arıkan E.N. 2020a. Evaluation of maximum and total open surface evaporation by using trend analysis method in Nigde Province of Turkey, *International Journal of Geography and Regional Planning*, 6(1):138-145

Bağdatlı M.C. & Arıkan E.N. 2020b. Evaluation of monthly maximum, minimum and average temperature changes observed for many years in Nevsehir province of Turkey, *World Res. J. Agric. Sci.* 7: 209–220.

Bağdatlı M.C. & Arslan O. 2020. Trend Analysis of Precipitation Datas Observed for ManyYears (1970-2019) in Niğde Center and Ulukisla District of Turkey. *International Journal of Recent Development in Engineering and Technolog*, 9(7): 1-8.

Bağdatlı M.C. & Ballı Y. 2019. Evaluation with Trend Analysis of the Open Surface Evaporation in Observed for Many Years: The Case Study in Nevsehir Province of Turkey. *Recent Research in Science and Technology Journal*, *11*: 15-23.

Bağdatlı M.C. & Ballı Y. 2020. Soil Temperature changes (1970-2019) in Ulukışla district in turkey by trend analysis methods. *International Journal of Plant Breeding and Crop Science*, 7(2): 851-864

Bağdatlı, M.C. & Bellitürk, K., 2016b. Negative effects of climate change in Turkey. *Advances in Plants and Agriculture Research*, *3*: 1-3.

Bağdatlı M.C., Bellitürk K. & Jabbari A., 2015. Possible effects on soil and water resources observed in Nevşehir Province in long annual temperature and rainfall changing. *Eurasian Journal of Forest Science*, *3*(2): 19-27.

Bagdatlı M.C., Uçak İ. & Elsheikh W. 2023. Impact of global warming on aquaculture in Norway. *International Journal of Engineering Technologies and Management Research*, *10*(3): 13-25.

Bekabil U.T. 2014. Review of challenges and prospects of agricultural production and productivity in Ethiopia. *Journal of Natural Sciences Research*, *4*(18): 70-77

Bellitürk K. & Bağdatlı M.C. 2016. Turkish agricultural soils and population, *Agricultural Research and Technology*, *1*(2), 555557.

Caruso R., Khadka P., Petrarca I. & Ricciuti R. 2017. The economic impact of peacekeeping. Evidence from South Sudan. *Defence and peace economics*, *28*(2): 250-270.

Dorosh P., Wang H.G., You L. & Schmidt E. 2012. Road connectivity, population and crop production in Sub-Saharan Africa. *Agricultural Economics*, *43*(1): 89-103.

Elsheikh W., Uçak I., Bağdatlı MC. & Mofid A. 2022a. Effect of Climate Change on Agricultural Production: A Case Study Khartoum State, Sudan. *J Agri Res*, 7(3): 000299.

Elsheikh W. 2021. Effects of Climate Change on Aquaculture Production. *Eurasian Journal of Food Science and Technology*, *5*(2): 167-173.

Elsheikh W., 2021. Traditional Dried and Salted Nile Fish products in Sudan: A review. *Eurasian Journal of Food Science and Technology*, *5*(1), pp.1-5.

Elsheikh W., Uçak İ. & Bağdatlı M. C. 2022b. The Assessment of Global Warming on Fish Production in Red Sea Region of Sudan. *Eurasian Journal of Agricultural Research*, *6*(2): 110-119.

FAO 2016. South Sudan. Rome: Food and Agriculture Organization of the United Nations (FAO). http://www.fao.org/nr/water/aquastat/data/wrs/SSD-eng.pdf (accessed 12 September 2023).

Fulginiti L.E., Perrin R.K. & Yu B. 2004. Institutions and agricultural productivity in Sub-Saharan Africa. *Agricultural Economics*, *31*(2-3): 169-180.

Jubek D.S.K., Bin X. & Loro E. L. L. 2019. Impact of climate change on water in south Sudan. *International Journal of Scientific and Research Publications (IJSRP)*, *9*(1): 8516.

Ministry of Agriculture, 2012. Ministry of Agriculture, Forestry, cooperatives and rural development. Republic of South Sudan. *Agriculture Sector Policy Framework (Aspf): 2012-2017*. https://faolex.fao.org/docs/pdf/ssd149325.pdf (accessed 4 September 2023).

MOE 2015. Fifth National Report to the Convention on Biological Diversity. Juba: Ministry of Environment (MOE), Republic of South Sudan. https://www.cbd.int/doc/world/ss/ss-nr-05-en.pdf (accessed 4 September 2023).

Moyo J.M., Bah E.H.M. & Verdier-Chouchane A. 2015. Transforming Africa's agriculture to improve competitiveness. *The Africa competitiveness report*, pp.37-52.

Kose M. & Kongas K., 2023. Impact of climate change on water resources in South Sudan. *Eurasian Journal of Agricultural Research*, *7*(1): 29-36.

Nasreldin M. & Elsheikh W. 2022. Impacts of Climate Change on Water Resources in Sudan. *Eurasian Journal of Agricultural Research*, *6*(2): 83-90.

Shimeles A., Verdier-Chouchane A. & Boly A. 2018. Introduction: understanding the challenges of the agricultural sector in Sub-Saharan Africa. *Building a resilient and sustainable agriculture in sub-Saharan Africa*, pp.1-12.

South Sudan, 2013. South Sudan: An Infrastructure Action Plan. *Aviation*, *18*: 131-167. https://www.afdb.org/fileadmin/uploads/Generic-Documents/SouthSudan.pdf (accessed 27 September 2023)