

Unlocking Sudan's Rice Potential: Economywide Impacts of Rice Sector Expansion under Alternative Development Pathways

Extended Abstract

Rice is becoming increasingly important in Sub-Saharan Africa (SSA) for food and nutrition security and economic growth, with more than 100 million livelihoods estimated to depend on rice systems across the region (AfricaRice, 2018). Consumption has grown faster than that of other major staples, driven by urbanization and dietary change, and rice is now a major source of dietary energy, particularly in West Africa and increasingly across SSA (FAO, 2022; AfricaRice, 2018). Yet regional production meets only about 40–55 percent of demand, leaving a large and persistent import gap, and costing the region several billion US dollars annually in rice imports (FAO, 2022). Demand is projected to continue rising by around 5–6 percent per year, with the consumption–production gap expected to widen further toward 2030 if productivity growth remains modest (AfricaRice, 2018; FAO, 2022; AGRA, 2024). This widening gap underscores the significant opportunity for domestic rice sector development to support food self-sufficiency, foreign-exchange savings, and broader agrifood system growth, especially given Africa's substantial underutilized land and water resources (AGRA, 2024).

Rice consumption in Sudan has increased steadily over the past two decades, reflecting population growth, rapid urbanization, and shifts in dietary preferences as the case in the rest of SSA. Sudan also hosts large areas of fertile lands suitable for rice production through most of the year, to ensure self-sufficiency and surplus exports to neighboring African and Middle Eastern countries. Despite these opportunities, domestic rice production remains limited, and Sudan relies heavily on imports to meet national demand. Official trade statistics from the Central Bank of Sudan (CBOS, 2024; 2022; 2021; 2019) show that rice imports rose sharply after 2020, both in value and volume, and that rice has accounted for up to 4 percent of total food import expenditure in recent years (see Annex Tables A1 and A2). This growing dependence exposes Sudan to international price volatility and foreign exchange constraints, particularly in the context of macroeconomic instability and conflict-related disruptions to trade and food supply chains.

At the same time, Sudan is widely recognized as having substantial untapped agricultural potential. Recent assessments highlight the country's favorable land and water endowments, both in rainfed areas in the southeast and western part and in irrigated systems along the Nile Basin, where productivity remains well below agronomic potential (World Bank, 2020; FAO, 2023). Rice has been identified as a strategic crop that could benefit from these endowments if constraints related to production management, seed systems, marketing and policy coordination are addressed. Sudan's National Rice Development Strategy documents recent efforts to reintroduce and expand rice cultivation in irrigated areas while emphasizing the persistent gap between domestic supply and national demand (Sudan Ministry of Agriculture, 2021). The scale

of this gap is evident in official CBOS trade data, which indicate sustained and rising rice imports over 2017–2024 (Annex Tables A1 and A2).

This paper develops a Sudan-specific recursive dynamic computable general equilibrium (CGE) model to evaluate the economywide impacts of alternative rice expansion pathways. The model is calibrated to a newly constructed Social Accounting Matrix (SAM) that explicitly disaggregates rice production and consumption. The SAM integrates national accounts and official foreign trade statistics from the Central Bank of Sudan with other data on rice area harvested, production, and yields.

Within this framework, rice is modeled as an irrigated and rainfed crop with scope for both extensive growth through area expansion and intensive growth through productivity improvements. The analysis considers four policy-relevant scenarios.

- The baseline reflects current production trends and continued reliance on imports.
- A gradual expansion scenario captures phased increases in irrigated rice area combined with moderate yield gains consistent with documented African irrigated rice systems.
- A self-sufficiency scenario explores conditions under which domestic production meets national rice demand, eliminating imports.
- Finally, an export-oriented scenario examines the macroeconomic implications of production levels exceeding domestic consumption, allowing Sudan to become a net rice exporter.

Across scenarios, the model tracks impacts on economic growth, the contribution of agriculture to GDP, and structural transformation. Particular attention is given to trade outcomes, including reductions in rice imports and associated foreign exchange savings, benchmarked against official CBOS import trends (Annex Table A1). Beyond macroeconomic effects, the modeling framework is linked to household-level microsimulation modules that map economywide price and income changes to detailed household survey data, allowing explicit estimation of changes in poverty prevalence and distributional outcomes. In parallel, the framework incorporates dietary consumption-based microsimulation to translate changes in food availability, prices, and incomes into indicators of undernourishment and food security, enabling an integrated assessment of welfare, poverty, and nutrition impacts alongside real consumption effects.

By combining official rice trade statistics with economywide modeling, this paper provides one of the first quantitative assessments of rice-based agricultural transformation in Sudan. The findings contribute to the literature by illustrating how strategic investment in an import-dependent staple crop can generate macroeconomic, trade, and welfare gains in a fragile and conflict-affected economy.

References

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Annex. Official rice import trends in Sudan

Table A 1. Rice imports and their share in Sudan’s food and total imports (Values in thousand US dollars)

Year	Rice imports	Total food imports	Total merchandise imports	Rice share of food imports (%)	Rice share of total imports (%)
2017	38,834	1,944,129	4,100,381	2.0	0.9
2018	41,784	1,969,049	3,478,333	2.1	1.2
2019	47,332	2,141,438	3,734,657	2.2	1.3
2020	42,866	2,685,681	3,802,573	1.6	1.1
2021	76,315	1,911,992	4,279,017	4.0	1.8
2022	110,788	2,826,760	11,094,849	3.9	1.0
2023	—	—	7,498,500	—	—
2024	48,026	1,763,745	4,911,166	2.7	1.0

Source: Central Bank of Sudan Annual Reports (2019, 2021); Central Bank of Sudan Foreign Trade Statistical Digests (2022, 2024).

Table A 2. Rice import quantities (Quantities in metric tons)

Year	Rice imports (tons)
2017	73,601
2018	81,747
2019	91,887
2020	84,715
2021	147,617
2022	179,032
2023	—
2024	84,442

Source: Central Bank of Sudan Annual Reports (2019, 2021); Central Bank of Sudan Foreign Trade Statistical Digests (2022, 2024).