

## Self-Sufficiency of Rice in Sierra Leone: A Review

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### Abstract

*The purpose of this study is to examine rice self-sufficiency in Sierra Leone. The aim is also to predict the future self-sufficiency of rice. To achieve these goals, an in-depth review of existing literature was performed to draw inferences, insights and policy impact for the studied country. Further information was obtained from government reports and bulletins to supplement findings. In the present context of higher food prices, including rice, the prices for imported commodities are becoming excessively higher despite concerted efforts on the part of the government. In addition, the literature review and statistics' validation portray Sierra Leone's need to take appropriate measures to ensure rice self-sufficiency for future generations apart from focusing on capturing international market share. The most appropriate option would be to prepare and promote rice production plans either by devoting more land area or enhancing productivity or a combination of the two. Moreover, the analysis reveals the significance of policy evaluation and evidence-based interventions along with infrastructure development, improved access to information, and community effort in achieving self-sufficiency for food security, especially through a focus on the rice economy of Sierra Leone. These steps are destined to bring rural development, sustained livelihoods, and greater (or at least sustained) employment of rural youth, discouraging rural-urban migration in the country.*

**Keywords:** Rice Production, Prediction, Self-Sufficiency, Sierra Leone.

### 1. Introduction

Attaining food self-sufficiency, especially rice, has become the major challenge facing policymakers and researchers in Sub-Saharan Africa. According to a West African Rice Development Association (WARDA) survey, Sub-Saharan Africa (SSA) has the largest yearly rice consumption, at 104 kg per capita in 2007. However, it rose to 187kg in 2017 (Sheriff et al., 2012). Africa plays a major role in the international rice market. It represented 32% of world imports in 2007 and reached a record high of 6 million tonnes that year. The reason for Africa to become a rice importer is that rice has become the fastest-growing food source in sub-Saharan Africa over the past decade (Avotide, 2012). The relative growth of rice demand in this region is faster than anywhere else in the world due to population growth (4% per year), rising incomes and consumer preference for rice, especially in urban areas (Kanteh, 2012; Conteh, 2012). In recent years (from 2001 to 2005), there has been an annual increase of 6% in rice production, mainly due to land expansion with a 60% increase in production, but only 30% of production is due to increased productivity (Danstop, 2011). However, WCA's rice demand exceeded local production (Conteh, 2012). Africa planted rice on about 7 million hectares in 2016 and for the first time, production exceeded 23 million tons. In the future, an increase of 7% per year is expected to meet consumption demand (Conteh, 2012). Recent global trends in the rice industry indicate that demand for goods



imported into Africa is increasing. This is proof of the pressure on global supply and the steady rise in global market prices of rice over the past five years (Conteh, 2012).

In Sierra Leone, rice is a staple diet for more than 90% of the population (Spencer et al., 2009). The rice crop sub-sector accounts for around 75% of the Agricultural Gross Domestic Product (AGDP) (Bah, 2013). Unfortunately, the country remained unable to meet its domestic consumption need for a longer period despite having an area of 72,300 square kilometres (74%), of which 5.4 million hectares are suitable for cultivation. (Sheriff et al., 2020). The government has prioritized agriculture as the most significant economic sector since independence in 1963. Agriculture employs about two-thirds of the country's workers and accounts for roughly 60% of the country's GDP (ITA, 2021). The uplands cover 4.3 million hectares, whereas the lowlands cover 1.1 million hectares. More than 90% of the lowlands can be farmed and are suited for rice production (Sama et al., 2019). The most fertile country's regions are the Inland Valley Swamp (IVS), followed by the lush bowl-shaped Bolivian land in the north, deep-water flooded river grassland in the south, and tidal mangrove swamp coastal zone in the northwest. A population of approximately two-thirds lives in rural areas and relies on agriculture to live. National rice prices have steadily increased, yet the country imports about 40% every year (Spencer et al. 2019). To lower the national rice production shortfall, the government concentrated on enhancing agricultural productivity as part of a national food security policy. The Sierra Leone Agriculture Chamber of Commerce was established by the Ministry of Agriculture, Forestry and Food Security (MAFFS) as a platform for the private agriculture sector. They aim at encouraging private agricultural investment, with a concentration on rice self-sufficiency at the national level (Spencer et al. 2019). Despite all these efforts, the country could only produce up to 60% of its domestic need in 2019

## 2. Concept of Self-Sufficiency

Food self-sufficiency is a word that is frequently used, though it is rarely defined. This could be because the notion has various definitions. The FAO (1999) defines it in its broadest sense "The idea of food self-sufficiency usually refers to the degree to which a country can meet its food demands from local production". Some analysts define food self-sufficiency as a country that avoids all food trade and depends only on domestic food production to meet its food needs. A country with closed borders self-sufficient in the food industry can be a feature of this definition (FAO, 2015a). Given the importance of commerce in today's global economy, a more practical definition of food self-sufficiency is when domestic food production equals or exceeds a country's food consumption (FAO, 2012: 360).

Measuring the self-sufficiency of food involves the use of various indicators. The self-sufficiency rate (SSR) is a key indicator of this notion's more practical grasp. Typically, the indicator is calculated for a certain item or commodity category (such as rice, wheat, corn or cereals). Food production is expressed as a percentage of available supply in SSR, as stated in the following equation (FAO, 2012: 360):

$$SSR = \text{Production} \times 100 / (\text{Production} + \text{Imports} - \text{Exports})$$

A country's per capita Dietary Energy Production (DEP) can also measure food self-sufficiency. Countries that produce 2500 kcal or more daily/person are often regarded as self-sufficient. Most nutritionists believe that consuming at least that many calories per day are essential to guarantee appropriate nutrition (Porkka et al., 2013). Food production from 2000 to 2500 kcal/person daily is classed as "insufficient" by Porkka et al. (2013: 3), while food production under 2000 kcal daily is defined as "low."

In this context, this review is conducted to; examine the concept of self-sufficiency, particularly concerning rice, Review the Rice Trade Policies, Food Security and Food Self-Sufficiency in Sierra Leone, assess the government effort in meeting development objectives in rice self-sufficiency, estimated crop yield in different ecological zones in Sierra Leone, and to showcase potentials in achieving rice self-sufficiency and the way forward. The review's materials came primarily from Google Scholar and Science Direct searches of linked literature. The rest of the material came from official publications. Sierra Leone's Ministry of Forestry and Food



Security (MAFFS), International Rice Research Institute (IRRI), Food and Agricultural Organization (FAO), World Food Program (WFP).

Different authors in developing countries have applied the idea of self-sufficiency in different contexts. In Indonesia, for example, Mears (1984) noted that Boeke utilized the idea of self-sufficiency in a unique way when he developed his theory of dual socio-economic policies. The personal self-sufficiency (or self-sufficiency) of growers characterizes the economy of modern and traditional rural societies. As inter-regional trade grows, the demand for money and credit grows, and the rural economy's self-sufficiency is often undermined. In addition, Boeke spoke about the widespread use of locally produced goods made in mechanized factories, which ultimately led to the self-sufficiency of communities and villages. Self-sufficiency entails a complete lack of reliance on commodities produced outside the self-sufficient economic sector (Mears, 1984).

Luan et al. (2013) pointed out that there is lower food self-sufficiency in Africa today than throughout the past trend in decades. They further stated that demographic expansion, giving rise to a higher increase in the demand for food than in food production can be a probable reason. FAO (2015a) mentioned that some observers define food self-sufficiency as a country that avoids all food trade and relies only on domestic food production to meet its food needs. Clapp (2017) looked into the prevalence of trade in today's economy and gave a pragmatic understanding of food self-sufficiency as domestic food production that meets or exceeds 100 per cent of a country's food consumption. Clapp further stated that food self-sufficiency is measured by a country's domestic food production capabilities rather than specific crops.

### **3. Review of Agricultural Policies in In Sierra Leone**

#### **3.1 Colonial Era**

During the colonial era till the late 1950s, just before independence, the country was self-sufficient in food production. The country was able to meet its demand for rice through its domestic production. Around 1935, the country exported 1,024 tons (Moore-Sieray, 1988). However, the policy framework emphasized the cash crop export (cocoa, coffee, palm Kernels, ginger, etc.) while undermining food production. Even the land areas utilized for food production were converted to cash crops. During this period, no support was provided to the upland rice farmers who were the nation's basket food, resulting in poor liaison between farmers and appointed rice officials. The rice cultivation and production programs were primarily to alleviate dissatisfaction with domestic food prices rather than develop and greatly increase the country's staple food. Additionally, the policy failed to recognize that policies interplay and contend for scarce human and financial resources. Consequentially, the country that was self-sufficient in rice production becomes a net importer.

#### **3.2 Post-Independence (1961 to 1999)**

Sierra Leone agricultural production relies most on rainfall with little irrigated agriculture, making the farmers more prone to climate adversity. Although the country became a net importer in the late 1950s, the real consequences started to be showcased in the late 1970s. From 1960 to 1975, as the land area expanded, rice production increased and, to some extent, so did production. Data from UDSP, 2021 indicated that the country only experienced rice self-sufficiency in rice production in three consecutive years (1974, 1975 and 1976) since independence Fig1. In the late 1970s, rice production reached about 400,000 tons. In the late 1980s, average production dropped to around 330,000 tons. After the civil war devoured the country in the mid-1990s, this number fell further to around 180,000 tons. The rice production was lowest at 120,000 tons when the civil conflict was at its peak in 2000.

The policies in this era were tailored toward Socio-economic and agricultural development. The specific goals were to boost economic output and growth. To raise rural people's living standards by enhancing the sector's productivity and producing revenue, the policy framework includes Import Substitution Industrialization (ISI) program and The Integrated Agricultural Development Projects (IADPs). The overall goals of these programs were to raise living standards of the people by providing their fundamental requirements, increasing

productivity, and reducing rural areas' vulnerability. These goals had to be met by making available intensive extension support to local farmers, subsidized planting materials, equipment, fertilizers, other chemicals, granting farmers periodic loans, developing infrastructure including access roads and wells, and contracting expatriate managerial staff. In addition, in collaboration with other donor partners, the World Bank created the Agriculture Sector Support Project (ASSP) to reorganize the agricultural sector and modify policies by Sierra Leone's Structural Adjustment Program (SAP). Instead of a regionally centered international agricultural development plan, the project strives to coordinate all agricultural strategies at the country's level. The policies under review were not successful because Sierra Leone relied too heavily on financial assistance for most of its projects towards development that is not optimal for the agricultural industry. Farmers were not in most cases paid for their products due to a fall in the producer prices. Other constraints were; export market's unpredictability, poor planning, corruption, and mismanagement.

### **3.3 Conflict Reconstruction and Strategy Policies 2000 to 2008**

The policy's goal was to consolidate peace and lay the foundation for stability and rebuilding of socio-economic infrastructures. To achieve the desired result, the government in that era inaugurated many programs. These programs were;

1. Interim Poverty Reduction Strategy (IPRSP) – The IPRSP aimed to rebuild the country while tackling the root causes of war through rapid measures to reduce poverty and achieve economic growth that benefits the poor.
2. Programs to alleviate poverty as well as enhancing economic prosperity for the Poor.
3. National Social Action Plan - NaCSA implemented the program. It was created to help communities recover their social and economic capital.
4. The National Recovery Strategy (NRS) - In 2002, the NRS concentrated on: (a) consolidating state power and building peace; (b) promoting reunification as well as human rights implementation; (c) promoting repatriation, reintegration, as well as community rebuilding; (d) promoting accessibility to existing unreachable locations as well as accelerating the delivery of service; and (e) promoting economic growth.
5. The Vision 2025 Planning Program - The government's poverty strategy has also been formulated within a larger vision of the Sierra Leone long-term growth program set out in the 2003 "Vision Plan for 2025". The document sets out the main objectives that Sierra Leone must achieve to attain a vision of calm, peace, and prosperity and break the cycle of poverty and underdevelopment.
6. The Poverty Reduction Strategy Paper (PRSP) - The full PRSP was finished in 2005. It outlines the country's macroeconomic, institutional, and social policies and plans, executed by 2007 to foster wide-ranging economic development and help external financial support alleviate poverty.

Even though agriculture wasn't the core concern of the IPRSP, increased external help hastened the relocation and rehabilitation processes, which had a trickle-down effect on the agriculture industry. The NRS, like the IPRSP, was not particular to agriculture, but it established a solid relationship for the sector's future development. Even though some of those initiatives were not directly tied to agriculture at the outset, with the recovery of the agriculture, mining and service industries, they laid solid foundations for the development of the sector and economy. The rice output was increased significantly from 2000 to 2006. However, in 2007, due to the Ebola outbreak, the agricultural sector, especially the rice sub-sector, experienced a severe shock resulting in a fall in rice output by almost 50 per cent compared to the previous year.

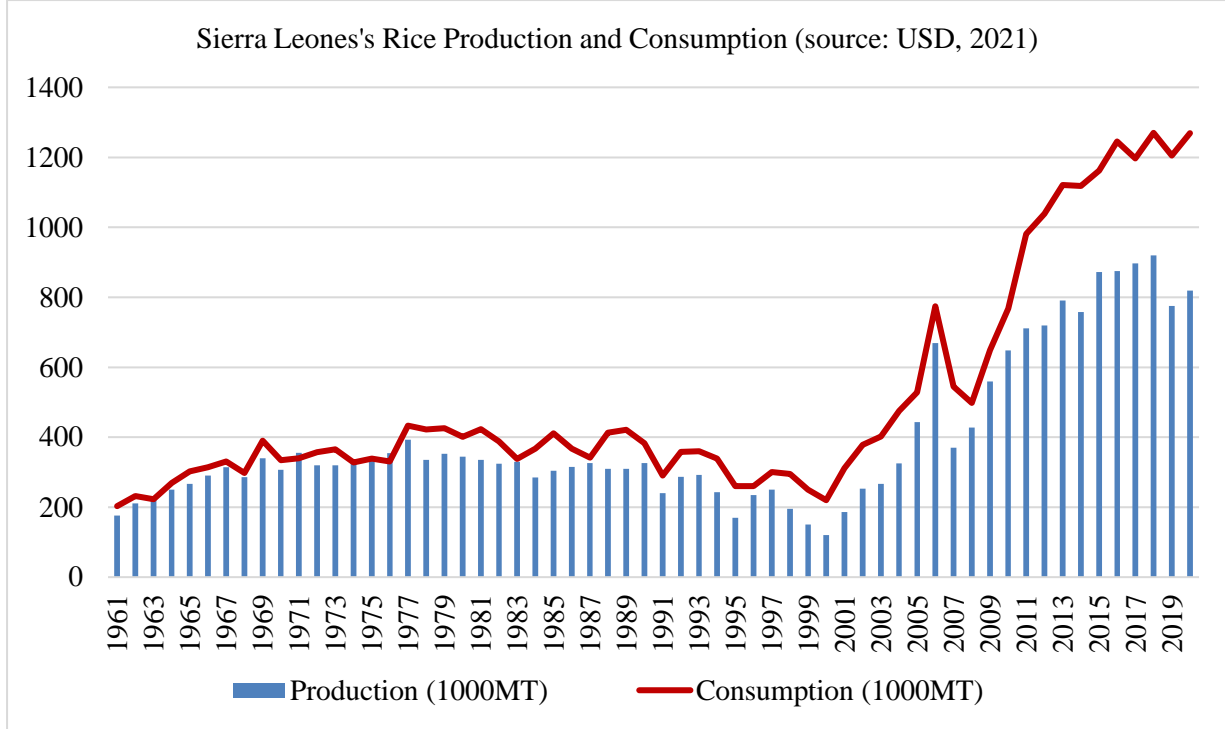


Figure 1: Sierra Leones's Rice Production and Consumption (Source: USDA, 2021)

### 3.4 New Policy Frame Work: Economic Development Revitalization and Poverty Reduction Strategy/ Food Security Policy (2009 till Date).

The policy goals were to; expand agricultural production and food availability through crop diversification, to increase income and employment in rural areas while ensuring adequate environmental protection, Accelerate the fulfilment of the MDGs of eradicating poverty and achieving food security, and finally to increase the production of food and cash crop for both home and foreign markets. Although rice production increased significantly from 428 thousand Metric Thousand (TMT) in 2008 to 920 TMT in 2018 with little fluctuations in 2014, rice self-sufficiency was never attained. While production increased at an arithmetic rate, consumption increased at a geometric rate. The increase in rice production was mainly due to land expansion as against productivity gain. During the review period, the policy framework targeted rice production to rise from 559,000 MT in 2009 to 1,166,729 MT in 2018 with an average yield of 4.0 t/ha. However, the predictions were not met due to relatively poor policy implementation, weak technology, poor research, high cost of input, over-dependence on rainfall, policy inconsistency, poor training, extension gap and corruption. The average yield per hectare is less than 2t/ha (Table 1) against the targeted 4.0 t/ha. The above review is in line with (Kargb 2009 and Ofori et al., 2019), who reported that policies had been failing after implementation mainly due to several problems ranging from lack of necessary financial and moral stakeholder support, inadequacy to absorb, control exogenous factors and sustain implementation activities by the agricultural sector, inconsistency, administrative mismanagement, limited financial and material support, pest and crop failures, insufficient inputs, over-reliance on donor support, policy parody, political interference.

### 4. Major Rice Producing Area of Sierra Leone

Although the arable land presently under cultivation is just 15 per cent of the cultivatable area, smallholder farmers with an average land size of 0.5-1.0 ha are the major rice producers in the country. They have limited farm inputs to work, are poorly trained, and population growth puts a heavy burden on the ecology due to deforestation and dare need for expansion of farmland (Siddik et al., 2015; Koroma et al., 2019). In addition, the soil is less fertile due to erosion of nutrients and heavy leaching (Kamara et al., 2019; Conteh et al., 2020).



Similarly, due to the low-level use of rice farm machinery, the rice farmers are highly dependent on family labour which is insufficient to raise productivity. As a result of the enactment of labour law by the state and financial constraints faced by small-scale farmers, it is more difficult to expand the size of farms and increase productivity. Table 1 shows that the cultivation area and the yield obtained per hectare were relatively low, especially in the lowlands. This signaled that more efforts are needed from all stakeholders to improve rice production, either by increasing productivity through better agronomic practices and input supply or by expanding the area under cultivation or a combination of both. (Frison et al., 2011; Teklewold et al., 2013; Kassie et al., 2011) Opined that increasing productivity through better agronomic practices and input supply is more reliable and sustainable due to climate change and ecological destruction. On the contrary, (Akinnifesi et al., 2010; Akibode, 2011; Murith et al., 2016) suggested that increasing the area under production is also vital under African context since cultivated areas are always less than the cultivable area in most of the Sub-Saharan African region, Sierra Leone inclusive. From those above, it can be concluded that to achieve self-sufficiency in Sierra Leone; both options could be applied.

Table 1: 2018 District-Wise Productions of Rice, Areas Cultivated as well as Yield in Sierra Leone (Source: <https://www.shininginstitute.com/blog/2019/12/22/sierra-leone-boosting-rice-production-is-feasible-1>)

District	Paddy Production (Mt)	Area Cultivated (ha)	Average Farm Size (ha)	Yield (t/ha)
Kailahun	14,227	20441	1.44	0.70
Kenema	68,289	71993	1.05	0.95
Kono	24,787	21331	0.86	1.16
Bombali	189,983	105312	0.55	1.80
Kambia	57,805	35837	0.67	1.61
Koinadugu	115,162	54169	0.47	2.13
Port Loko	109,605	81045	0.73	1.35
Tonkolili	57,514	52020	0.90	1.11
Bo	163,687	201585	1.23	0.81
Bonthe	146,519	110831	0.76	1.32
Moyamba	145,461	114537	0.79	1.27
Pujehun	58,700	39534	0.67	1.48
Western Area	14,990	5030	0.33	0.90
Total	1,166,729	913,665	<b>0.80</b>	1.27(AY/ha)

Table 1 data above, Fig 2 shows which district had the highest cultivated area and the lowest land area. The figure also shows the district with the highest yield/ha and the largest average farm size. These indicators are relevant in determining the areas that need more intervention. It also gives a clear picture of the rice production potentials of each region. The graph shows that Bo district has the largest cultivation area but unfortunately has one of the lowest yields per hectare (0.80/ha). This is probably due to low soil nutrients, lack of inorganic fertilizer, and insufficient pesticide, as reported by (Harling, 2008). Conversely, Koinadugu has the highest yield per hectare, 2.13t/ha, but with the smallest average farm size; the small farm size in the area might be due to relatively high yield realized compared to other production sites. In terms of metric tons produced, Bombali district produced 16.3% of the entire paddy produced in the county in 2018.

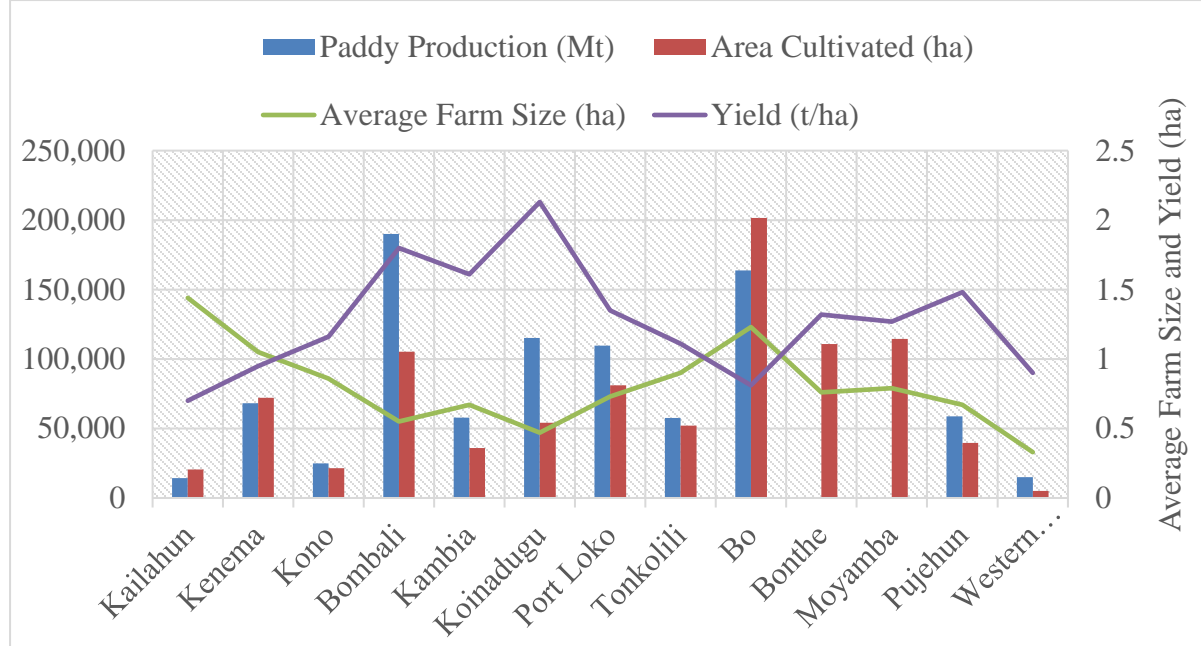


Figure 2: Bar Chart Showing Cultivated Area (ha), Paddy Production (Mt) and Yield (t/ha) in Sierra Leone. (Source: USDA, 2021)

The succeeding government has introduced several production-boosting measures, including rice extension services to swamp areas, mechanical ploughing, rice seed propagation programs, the establishment of a rice business, and the Torma Bum Rice Development Authority. International agricultural and finance agencies, including the FAO, the World Bank, the African Development Bank and others, have not been idle in this work. Foreign countries have also helped, including the Chinese rice research and demonstration farms, the Germans (GTZ project for the propagation of rice seeds) and the Americans. They all work with the Njala Rice Research Institute of the Agricultural College. The work is closely related. All of these efforts to promote rice production have resulted in spectacular failure. Today, Sierra Leone's annual rice imports cost approximately \$ 200 million (<https://www.natinpasadvantage.com>).

The average annual rice consumption per person is around two rice bags (or 100 kg). With a population of 7 million, the total annual rice consumption in Sierra Leone is 700 million kilograms or 700,000 tons (Seck, 2012). A new plan with new perspectives for self-sufficiency for rice has emerged. In September 2020, the central government and the Turkish company SALA Group signed an investment contract for rice planting worth the US \$ 275 million. The project is located on 57,000 or 110,000 hectares in Torma Bum, Bonthe District. This has been the riverside area since the 1950s, and it has always drawn government attention to rice development. An internet account reported on a press conference by the Ministry of Agriculture about the project thus: The project will ensure that irrigation and other advanced farming systems are used to produce the rice three times per year.

## 5. Rice Trade Policies in Sierra Leone

Louhichi et al., 2014 mention out that the Government of Sierra Leone has formulated and implemented several policies towards boosting agricultural productivity. For example, rice trade policy in Sierra Leone has long been an important feature of agricultural policy. The declared goal of the colonial government's policy was to make sure that sufficient high-quality food and fiber were made available to the domestic market and to offer producers stable prices. A rice mill sector was established in 1936 by the government to preserve the viability of rice production. The sector was later transformed into a major supplier during World War II. It then became a rice cooperative, and the Sierra Leone Agricultural Products Marketing Board (SLPMB) took over its operations once more (Bah, 2013).

Initially, at the sector's inception, the sole responsibility was purchasing rice for government workers living in the capital city (Freetown). It partnered with private traders but only focused on controlling prices during World War II. Two rice mills were in 1936 and 1951 installed in Freetown and Mambolo, respectively, to increase output. Following the Government's Rice Trade Policy Inquiry Committee (RTPIC) suggestions, the government began implementing farm gate agricultural price-fixing policy annually to protect the farmers and consumers from price volatility. According to Koroma, 1996; Smith, 2020 the sector also bought and imported the local rice. This policy lasted until 1998, when SLPMB was given sole authority to purchase and import domestic rice.

Notwithstanding, the policy has since been modified. The importation of rice is in private entities, organizations, and institutions making the sector respond wholly to the current market realities. (Zack-Williams, 1993). Table 2 presents rice imports and rice supply to Sierra Leone's market.

**Table 2: Imports and Domestic Production of Rice in Sierra Leone, 2015-2018 (Source: MAFFS, 2017)**

Year	Total supply volume (Mt)	Domestic Production volume (Mt)	Imports Volume (Mt)	Value (US\$'000)
2015	917,560	597,216	320,344	141,490.03
2016	1,029,709	695,255	334,454	96,886.67
2017	1,149,547	538,241	611,306	191,380.19
2018	959,513	551,751	407,762	120,083.47

Table 2 shows that the country spends a significant amount of money annually on rice importation. This money could have been saved for other infrastructural development that promotes the economic wellbeing of the country. In other words, the country is like importing poverty to its citizen while at the same time exporting wealth to other civilizations.

## **6. Estimated Crop Yield in Different Ecological Zones in Sierra Leone**

The rice ecosystems are characterized by land height, rainfall patterns, flooding depth, and the drainage system of Sierra Leone. There are five types of ecology in rice cultivation: Inland Valley Swamps (IVS), Grassland Savanna Depressions (Bolilands), Mangroves, Riverain and Uplands. The data are shown in Table 3 below.

**Table 3: Ecosystems showing Arable and Cultivated Land (Source: NRDS - Sierra Leone, 2009)**

Ecology	Specific Area ("000" ha)	Arable Area (%)	Average Yield (Mt/ha)
Upland	430	80.23	0.97
Inland valley swamp	63	11.75	1.77
Mangrove swamp	200	3.73	2.93
Bolilands	120	2.24	0.99
Riverain grassland	110	2.05	2.62



Table 3 presents the rice ecological zones, the cultivated area in ha, the average yield obtained in each zone and the percentage of arable land. From table 3, it can be seen that upland ecology is the most essential for small-scale farmers. Cultivated land is 80.50% of the total cultivable area but with the least yield per ha. The mangrove swamp and riverine area had the highest average yield per ha, mainly due to the high rainfall compared to the drier upland rice. Mangrove swamps are mostly located on the country's southern and northern coasts and are distributed between 2% and 19% of cultivable land in the six districts where they are found.

In the entire zones, the yield obtained as per below the potential. According to (MoFA, 2009), the potential yield of low land rice in SL is 4.0mt/ha while upland rice is 2.0mt/ha. From this estimate, we can see that the realized yield in the country is just about 50% and 47% of the lowland and upland potential yield, respectively. This is primarily due to some institutional, economic, social and soil and environmental constraints itemized in table 4.

Table 4: Major Constraints of Rice by Ecological Zone

Ecological Zones	Major Production Constraints	Possible Solutions
Upland	a) Weed growth and rainfall failure (Bah, 2013) b) difficulty in pest control (Sankoh et al., 2016)	a) Irrigation agriculture b) Rainwater harvest c) Integrated pest management.
Inland Valley Swamp	a) Inadequate drainage as well as flooding regularly. b) Ineffective water conservation. c) Iron and aluminium poisoning are associated with lower soil fertility, especially during dry periods. d) Insufficient water retention and water supply during the dry period (Bah, 2013).	a) Efficient drainage system b) Water harvest technology c) Use of organic matter and liming d) good water management practices
Mangrove Swamps	a) Presence of saltwater, weeds, fish, and crabs c) Problems of acidity (Jordan, 1964)	a) Addition of lime in the soil
Bolilands	a) Deficient in organic matter and CEC b) Mostly made up of heavy soil or sand. (Bah, 2013).	a) application of organic mater b) better cultural practices
Riverain grassland	Rats destroy crops and tall grass (grass cutters), hence creating difficulty in harvest (Bah, 2013).	a) Planting early-maturing cultivars, and erecting cultivars. b) Integrated weed control method.

## 7. Potentials of Achieving Self-Sufficiency of Rice in the Future

The country has a huge agricultural potential of about 5.4 million hectares suitable for cultivation. However, only about 10% are cultivated, and rice occupies about 52% of the cultivated area. Additionally, the country is blessed with many major rivers, namely Great Scarcies (Kolente River). Little Scarcies (Kaba) river, Rokel River, Jong River, Moa River, Mano River, Sewa River, Sherbro River, Bankasoka River. The discharges of these rivers vary widely according to seasons; they can be explored to establish a large-scale irrigation system (Kamara et al., 2014). Importantly, the country has about 160KM<sup>3</sup>/year as a total of Internal Renewable Water Resources (IRWR) (MAFFS-MFMR 2004). Sierra Leone also has abundant labour to carry out all cultural practices and farm operations.

Similarly, the country's climate is a monsoon type humid tropical comprising six months (May to October) rainy season and six months (November to April) dry season. The rainy season can be a good opportunity for realizing higher production in the self-sufficiency drive if properly tapped. At the same time, the dry season can also be utilized for dry season farming achieving year-round cultivation. In conclusion, the country has a competitive and comparative advantage in increasing production, enhancing farmers' income and meeting its food needs. In particular, irrigation can promote sustainable rice productivity, reduce poverty and create employment opportunities, more importantly for youths.

## **8. Conclusion**

Self-sufficiency of rice in Sierra Leone remains crucial as life itself. The significance of rice is reflected in its huge annual import expenditures. In 2018, 408TMT were imported costing approximately US \$ 120,083.47. Although the rice self-sufficiency rate increased significantly from 2012 to 2018, a large amount of rice is required to meet the needed 53,000 milled rice per year (Sheriff et al., 2020; Moinina et al., 2021). Any effort to achieve self-sufficiency in rice production must start by addressing the challenges bedeviling rice production in the country. Strategies in attaining rice self-sufficiency should include training in rice production techniques such as the System of Rice Intensification (SRI). Rewarding for rice cultivation such as rice production competitions should be provided to farmers. In addition, the government needs to invest more in agricultural infrastructure, including irrigation, feeder roads and warehouses. Advanced marketing programs for domestically produced rice to compete in quality and quantity with imported rice are necessary. By supporting rice production and productivity, increasing the production via support programs might help reduce poverty in the rural areas and ensure food security.

## **9. Appropriate Strategies Needed for Rice Self-Sufficiency**

The country has great potential for rice self-sufficiency but should undergo major agricultural transformation. The main strategy is to increase the production of small farmers and their access to the market. This requires major and pragmatic changes in government policy. Agriculture's means of production, including farm inputs, fertilizers, and seeds provided by the government that has failed for several years, should be reviewed. This does not imply that the government should abandon assistance for smallholders; rather, it should develop a new model and make rational contributions based on local circumstances and farmers' felt needs. The following general strategies should be adopted to ensure sustainable rice productivity, increase rice production, and achieve self-sufficiency.

### **1. Establishment of Irrigation Schemes**

The establishment of large-scale irrigation schemes in areas with higher rice production potential should comprise economically feasible canals and low-water irrigation to optimize as much as possible the use of high-yielding varieties that are sensitive to fertilizers. There is a need to determine the appropriate planting methods to adapt to environmental conditions, including water availability, soil conditions and suitability for mechanization.

### **2. Input Supply and Credit Facilities**

Provision of input supplies, intermediate technologies suitable for the farmers and the environment, tractor hiring services at a cheaper rate, credit facilities are essential in achieving self-sufficiency. The government must adhere to measures aimed at diversifying the rural poor's income and conserving the natural resources of the production environment to achieve sustainability

### **3. Improvement of Rural Infrastructure**

It includes the construction and rehabilitation of access roads connecting major rice growing areas to the market and facilitating the flow of inputs and services. It also includes the construction and rehabilitation of drying



floors, storage and milling stations to promote value addition and commercialization; these can also enhance employment opportunities, particularly for young people.

#### 4. Rural Markets Rehabilitation and Expansion

Markets must be upgraded, and some new markets must be built. The market requires a long-term framework and capabilities to transport agricultural products easily. Booths, secure storage, warehouses, food preparation and selling areas, drainage systems, bathrooms, water distribution systems, garbage disposal facilities, suitable loading and unloading truck facilities, parking spaces, and enclosed markets should all be included.

#### 5. Effective Delivery of Farm Services and Technology

The goal of research ought to be to develop acceptable and dependable technologies utilized by farming communities. Leading actors involved in rice production and productivity need to be encouraged to participate in the innovation process, propagation and introduction of new solutions to production.

#### 6. Collection of Data and Market Information System

A market information system is required to commercialize the rice sector. The private sector and donor organizations equally need data for formulating, monitoring and evaluating the program.

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