

REPUBLIC OF BURKINA FASO



Policy Options for Rice Import Substitution in Burkina Faso

HUB FOR AGRICULTURAL POLICY ACTION (HAPA)



REPUBLIC OF BURKINA FASO Ministry of Agriculture and Animal and Fishery Resources (MARAH)

Policy Options for Rice Import Substitution in Burkina Faso

Policy Options for Rice Import Substitution in Burkina Faso July 2023

Ministry of Agriculture and Irrigation Development Burkina Faso / Ministère de l'Agriculture et des Aménagements Hydro-agricoles Ouagadougou Burkina Faso www.agriculture.gov.bf/accueil

E-mail(s): info@gov.bf

The Ministry of Agriculture acknowledges the following funding and technical partner:



ABOUT AGRA

AGRA is an African-led non-profit organization formed in 2006 in response to the call by former UN Secretary-General Kofi Annan for a uniquely African green revolution. AGRA's vision is to transform agriculture from a solitary struggle to survive into farming as a business that thrives, putting farmers at the center of the continent's growing economy. AGRA recognizes that developing smallholder agriculture into a productive, efficient, and sustainable system is essential to ensure food security, lifting millions out of poverty and driving equitable growth across the continent. AGRA's mission, therefore, is to catalyse and sustain an agricultural transformation in Africa through innovation-driven productivity increases and access to markets and finance that improve the livelihoods of smallholder farmers. AGRA achieves this mission with and through partners.

About HAPA

Across African countries today, there is a need for better, more timely use of evidence, and more targeted approaches, to improve the quality of policymaking by governments. The Hub for Agriculture Policy Action (HAPA), is a Unit within AGRA that provides policy advisory services to governments seeking to reform, refine, and/ or develop a more clearly defined policy direction. The approach recognizes the urgent need for timely policy support to the agriculture sector, which plays an important role in ensuring inclusive growth. It also recognizes the demands for political expediency and the need to ensure that a particular policy direction is anchored in evidence.

Through Consolidation and Translation (C&T) of evidence, HAPA's work entails collating existing evidence, expertise and best practice that are relevant to a government request for policy support and processing these into a set of rationalized and costed policy options. HAPA works with local partners such as research actors to collate existing data and evidence, expertise, and best practices that respond to a government request for policy support and package these into a set of actionable policy recommendations.

Comments

Comments, suggestions as well as requests for clarification of information contained in this report are welcome and should be addressed to: <u>AGRAHAPA@agra.org</u>

The opinions expressed in this report are those of the authors and do not in any way reflect AGRA's official policy or position, nor of its employees, partners or affiliates. The mention of specific companies, manufacturers or their products, whether or not these have been patented, does not imply endorsement or recommendation or approval by AGRA, its employees, partners or their affiliates in preference over others of a similar nature that are not mentioned. The descriptions, charts and maps used do not imply the expression of any opinion whatsoever on the part of AGRA concerning the development, legal or constitutional status of any country.

Table of Contents

ABBRE	EVIATIONS AND ACRONYMS	7
FORE\	WORD BY MARAH'S MINISTER	8
NOTE	BY AGRA'S PRESIDENT	9
EXECI	UTIVE SUMMARY	. 10
1	INTRODUCTION	. 12
1.1.	Background	. 12
1.2.	Rationale	. 13
1.3.	Main Objective	. 13
1.4.	Structure of the report	14
2	RICE POLICY LANDSCAPE ASSESSMENT	. 15
2.1.	The pre-crisis period: From 1961 to 1970	. 15
2.2.	The crisis from 1971 to 1980	. 16
2.3.	Public Intervention from 1981 to 1994	. 16
2.4.	Liberalization from 1995 to 2006	. 17
2.5.	The food crisis from 2007 to 2011	. 17
2.6.	The post-food crisis period from 2012 to 2019	. 18
2.7.	The crisis period from 2020 to the present	. 18
2.8.	Review of policy options for rice importation	. 19
2.9.	Comparative analysis - Effects of rice policies in selected West Africa countries	. 20
2.10	Rice policies in selected ECOWAS countries – Case studies	. 22
2.11	Lessons learned from import substitution policy experiences	. 25
	Conclusion and Recommendations	. 26
	Recommendations	26
3	FOOD BALANCE SHEET OF RICE, ANALYSIS OF TRENDS AND FORECAST	. 27
3.1	Methodology	. 27
3.2.	Trend Analysis	. 28
3.3.	Projections Analysis	31
3.4.	Rice Balance Sheet	. 33
3.5	Conclusions and recommendation	. 38

4	DESCRIPTION AND ANALYSIS OF THE RICE VALUE CHAIN
4.1	Analysis of selected nodes of the rice value chain40
4.2	Mapping the Rice Value Chain in Burkina Faso47
4.3	Summary of challenges and constraints along the rice value chain
4.4	Conclusion and Recommendations50
5	EX ANTE IMPACT EVALUATION OF RICE POLICY OPTIONS
5.1	Methodology52
5.2	Description of scenarios for the rice import substitution policy
5.3	Ex-ante impact evaluation of productivity gains on the efficiency & competitiveness of the rice sector in Burkina Faso57
5.4	The ex-ante impact evaluation of trade policy on the efficiency and competitiveness of the rice sector in Burkina Faso61
5.5	The ex-ante impact evaluation of the import substitution policies on welfare gains63
5.6	Operationalization of the rice import substitution policy66
5.7	Conclusion and Recommendation68
6	CONCLUSION
7.	REFERENCES
8.	ANNEXES

Abbreviations and Acronyms

AGRODIA	Association of Wholesalers and Retailers of Agricultural Inputs
AVV	Development of the Volta Valleys
BNDE	National Bank of Economic Development of Senegal
CET	Common External Tariff
CGP	General Equalization Fund
CIR-B	Interprofessional Rice Committee of Burkina Faso
CIRIZ	Interprofessional Rice Committee of Senegal
ECOWAS	Economic Community of West African States
FCFA	African Financial Community Francs
IMF	International Monetary Fund
INERA	Institute of the Environment and Agricultural Research
MARAH	Ministry of Agriculture, Animal Resources and Fisheries
PABSO	Lowland Development Project in the Southwest
PNAR	National Rice Self-Sufficiency Program of Senegal
PNDES	National Economic and Social Development Plan
PNSR	National Rural Sector Program
PRACAS	Senegalese Agriculture Acceleration Program
PRP	Rainfed Rice Project
SAED	Senegal River and the Faleme
SAP	Structural Adjustment Programs
SNDR	National Rice Development Strategy
SLEC	ECOWAS trade liberalization program
UEMOA	West Africa Economic and Monetary Union (WAEMU)
VAT	Value-Added Tax
VCA	Value Chain Analysis
WB	World Bank

Foreword by MARAH's Minister

The rice sector plays a crucial role in Burkina Faso's economic development and food security. It ranks fourth in terms of acreage, production, and per capita consumption of cereals, following maize, millet, and sorghum. The demand for rice has been steadily increasing due to population growth, urban expansion, and changing food habits.

Over the past decade, rice production in Burkina Faso has been growing steadily, almost doubling the area under cultivation. However, local production falls significantly short of meeting the demand, resulting in the need to import over 300,000 metric tons of rice. This heavy reliance on imports has led to a 35 percent increase in rice imports, causing significant economic strain and foreign currency outflows. It also poses a serious risk to food security and political stability in the country.

In addition to existing challenges, global events such as the Covid-19 crisis, the war in Ukraine, and recurring climate change impacts have disrupted agricultural supply chains, including rice, leading to higher food prices and exacerbating the food security situation.

To address these issues, the Burkina Faso government has initiated the "Produce a million tons of rice" flagship program, led by the Ministry of Agriculture, Animal Resources, and Fisheries (MARAH). The primary objective is to achieve an annual rice production level of 1 million metric tons by enhancing the efficiency of the rice value chain through appropriate policy measures. To this end, MARAH sought technical assistance from AGRA to generate evidence-based policy recommendations for implementing a rice import substitution policy, promoting the local rice sector.

This report identifies various challenges hindering the development of the rice sector, including a fragmented value chain, low productivity, lack of access to capital, competition from cheaper imported rice, and inadequate storage and transport infrastructure. To accelerate the transformation of the rice sector and improve production, processing, and marketing systems, it is vital to address these gaps along the rice value chain and implement specific policy interventions at each stage.

The report suggests that the most effective entry point for rice value chain development is to enhance rice productivity through the adoption of modern technologies. Investments in rice processing capacity and efficiency improvement are also essential. However, improving the rice transport chain may not yield significant impacts due to weak back- and forward linkages in the current commodity chain structure.

Besides productivity enhancement, special attention should be given to providing incentives that address the challenges of accessing credit, which is a major obstacle to local rice development. The government, along with development partners and AGRA, plans to mobilize funds strategically to develop the identified agropoles of Bagré, Samandeni, and Sourou, covering 50,000 hectares. This move aims to transform Burkina Faso from a rice import-dependent nation to a rice-exporting country.

Note by AGRA's President

The Government of Burkina Faso has made significant strides in boosting rice production within the country, but the growth has been primarily driven by expanding cultivated areas rather than improvements in yield. Nonetheless, certain regions, particularly lowlands practicing gravity irrigation and adopting enhanced rice varieties from AGRA-trained breeders disseminated by supported seed companies, have witnessed productivity growth.

During its initial strategy, AGRA played a pivotal role in empowering Government agents, researchers, and seed producers through grants to seed companies like NAFASO, which is now one of the largest seed producers in Burkina Faso, leading to increased local seed production and better access to quality seeds nationwide.

Despite these accomplishments, there remains a gap to meet the country's food demand and reduce the considerable rice import bills. Burkina Faso has the potential to become self-sufficient and even a net rice exporter in the region. AGRA's new strategy will focus on transforming the food system along identified value chains to significantly enhance smallholder farmers' productivity and income, improve food security, and strengthen linkages from input supplies to production, transformation, and market systems.

Given the challenges posed by global and regional shocks, such as market instability, the Russia-Ukraine conflict, food price inflation, climate change, the residual effects of the Covid-19 pandemic, and political and insecurity conditions in the Sahelian West Africa, rice emerges as a strategic food commodity. Burkina Faso can tackle these challenges through effective policies that bolster the rice sector and, ultimately, transform agrfood systems.

The policy environment and appropriate interventions at each level of the rice value chain are crucial. This aligns with the Government's "Produce a million tons of rice" initiative, led by the Ministry of Agriculture, Animal Resources, and Fisheries (MARAH), which aims to enhance the efficiency of the rice value chain through suitable policy measures. AGRA has been commissioned to provide technical support to MARAH, with a focus on assessing the current policy landscape, identifying policy gaps along the rice value chain, and predicting the potential impact of various policies on the welfare of the population.

The resulting recommendations prioritize productivity-enhancing technologies as the most effective entry point for value chain development in Burkina Faso. Subsequent investments in processing capacity and efficiency, coupled with well-functioning markets, are also crucial. These policy interventions are consistent with prevailing perspectives in many African countries. Ultimately, they are expected to boost domestic rice supply, reduce the price of husked rice to enhance competitiveness, and significantly diminish rice imports in the near future. This transformation is essential and achievable in Burkina Faso as part of the "Produce a million tons of rice" initiative.

Humi

Dr. Apollos Nwafor Vice-President Policy and State Capability AGRA

Executive Summary

Within the framework of the "Produce a million tons of rice" initiative, the Ministry of Agriculture, Animal Resources and Fisheries (MARAH) seeks to implement policy measures to improve the efficiency of the rice value chain in Burkina Faso. It ranks fourth in terms of acreage, production, and annual per capita consumption of cereals. Further, following the 2008 food crisis that led to a surge in food prices, rice emerged as a national priority. Again, the impacts of the Covid-19 pandemic and the war in Ukraine has led to disruptions in the supply chains of agricultural inputs and products in Burkina Faso. The limited supply of inputs, has a negative impact on food production, leading to high food prices, exacerbating an already critical food security The Covid-19 pandemic led to export restrictions in Asian exporting countries, triggering an increase in rice prices in Burkina Faso.

To find a structural solution to Burkina Faso's food vulnerability, the country embarked on an initiative to replace rice imports with local production under the "Produce a million tons of rice" aimed at closing the gap and ensure adequate quantities and quality of rice nationally. To achieve this, Burkina's rice value chain actors should be able to produce, transform, and market rice in sufficient quantity and quality. It is therefore important to identify the constraints and the opportunities along the rice value chain and propose specific policy interventions at each segment to accelerate the structural transformation of the rice sector. Hence, MARAH with the support of AGRA sought to investigate the effects of different policy interventions with a view to formulate import substitution policy interventions that promotes local rice production, transformation, and marketing while addressing the constraints along the rice value chain. This will require improving the efficiency and effectiveness of the Burkina's rice value chain through appropriate

and well-designed policy interventions that target actors along the value chain.

Through the Hub for Agricultural Policy Action (HAPA) unit, AGRA facilitated the study to provide scientific evidence for informed decision-making in designing and implementing rice policy options for Burkina Faso.

To identify priority areas for intervention for the improvement of the rice sector in Burkina Faso, this report 1) provides a landscape review of rice policies in Burkina Faso and draws lessons from best policy practices globally, but mainly from Africa and the ECOWAS region; 2) characterizes the detailed structure of the rice value chain and food balance sheet: 3) undertakes an ex-ante impact evaluation using a Computable General Equilibrium (CGE) framework to measure the effects of specific policy interventions; and 4) employ a microsimulation model to assess the impact of specific policy intervention on household poverty outcomes using the Foster-Greer-Thorbecke poverty indices (e.g., poverty rates, gap, and severity). The results of this study are meant to inform the government on priority areas for investment and policy reforms of the rice value chain in Burkina Faso in the short, medium, and long term.

In this study, five policy alternatives were modelled along the rice value chain. The first three options include the introduction of innovations at each stage of the rice value chain that would improve productivity. The other two options are trade policies related that would induce positive changes in the market.

The results show that policies to improve productivity and processing along the rice value chain can increase the domestic supply of rice, reduce the price of paddy rice, thereby significantly reducing rice imports. Rice productivity-enhancing technologies remain the most effective entry point for Burkina Faso's rice value chain development, followed by investments in rice processing capacity and efficiency improvements. However, investment in improving the transport sector does not appear to be a priority area for investment.

Furthermore, although policies to reduce trade margins and implement protective tariffs are found to increase rice production and reduce imports, their effects are negligible. Government interventions in the rice value chain should therefore focus primarily on increasing processing capacity, followed by productivity enhancement interventions.

The results also indicate that productivity gains in the rice sector and the reduction of trade margins would reduce the poverty rates in the country. Furthermore, the observed gains in both rice production and rice imports come at the expense of other food and cash crop sectors' performance. This production trade-off reveals distortions in the distribution of resources in the implementation of rice policies examined.

Therefore, this study suggests that to maximize the benefits of an import-substitution growth

strategy, a production and processingbased growth strategy is needed. There is a need for incentives that help stimulate precommercialization value addition. The results show that import substitution/reduction requires significant domestic production and an efficient processing system. For this to happen, the government of Burkina Faso should consider the following measures: 1) Create fiscal incentives to attract private sector investment in the rice production and processing sector, 2) Upgrade the existing rice mill and husking plants and 3) Strengthen the agricultural development fund's ability to facilitate credit where there is an investment need and gap.

To ensure transparency and avoid abuse of the policy options for rice importation; there is need to encourage the use of set guidelines and standards of rice products to ensure adequate supply of rice in terms of quantity and qualitý (authenticity, homogeneitý, moisture content, impurity levels and other aspects of rice varieties).

1 Introduction

1.1. Background

The transformation of the agricultural sector is a priority for the Government of Burkina Faso. This is reflected in the National Agricultural, Forestry and Livestock Strategic Investment Plan (PNIASP, 2021-2025) and the National Economic and Social Development Plan (PNDES II, 2021-2025). The major challenge the country faces is ensuring food security for its population with a growth rate of 3% per annum (INSD, 2020). About 3.4 million Burkinabe are food insecure (2022 Harmonized Framework) and 41.4% live below the national poverty line. The poverty incidence is worse in rural areas at 50% (INSD, EHCVM-2018). The prevalence of undernourishment is higher in urban areas (33.2%) than in rural areas (25.2%) for a national average rate of 30.8% of the population (INSD, EHCVM-2018).

The prevailing political instability, security situation, international market instability, food price inflation, climate change, the war in Ukraine and the residual effects of the Covid-19 crisis have exacerbated the food situation.

Rice is a staple food that is firmly entrenched in the dietary habits of the population in Burkina Faso. It ranks 4th in terms of acreage, production and annual per capita consumption of cereals in Burkina Faso (FAO 2018). Further, rice emerged as a national priority following the 2008 food crisis that led to a surge in food prices (G. Serpantié et al. 2019). Rice consumption in Burkina Faso fluctuates around 715,000 MT per annum with a growth rate of about 9.31% per year (FAOSTAT, 2022).

As in other West African countries, rice production in Burkina Faso has been growing steadily, driven by the increasing area under production rather than productivity improvement (FAOSTAT, 2022). The area under rice production has nearly doubled in the decade between 2009 – 2019 (92 percent growth), leading to a 76 percent growth in quantity produced. Despite the increase in production, consumption, which is estimated at around 715,000 MT (FAOSTAT, 2022), far outstrips local production. Demand for rice in Burkina Faso has been partially covered through local production, with a 53% selfsufficiency in 2019 (FAO, 2022).

Unlike other food products, rice is largely consumed by the urban population with a growth rate of 5% per year for the last 5 years (2015-2020) (Dick and Schraven, 2021). Given the insufficient local supply of rice, the country is vulnerable to shocks experienced in international markets; since it results to massive and costly imports annually to meet the rice deficit. The overreliance on imports for such a strategic crop poses a serious food security and political risk to the country and causes foreign currency outflows affecting the stability of the economy and development efforts. Furthermore, the local rice sector faces strong competition from cheap imports from Asia and neighboring ECOWAS processors that buy local rice and export it for processing.

To reduce the negative effects of cheap rice imports, the Government of Burkina Faso plans to introduce a policy for substituting imported rice with domestic one. The government expects that boosting local rice production, driven by the National Rice Development Strategy (SNDR II), will reduce Burkina Faso's rice imports by 75%, resulting in increased income and food security for about 119,000 households. This policy will provide an opportunity to strengthen the capacity, productivity, and competitiveness of the local rice sector.

It is against this background that the Ministry of Agriculture, Animal Resources and Fisheries requested technical assistance from AGRA to investigate the effects of different policy interventions that promote local rice production, transformation, processing, and marketing while addressing the constraints along the rice value chain. Through its HAPA (Hub for Agricultural Policy Action) unit, AGRA will provide scientific evidence for informed decisionmaking in designing and implementing policy options for replacing rice imports with local production. This assignment was conducted in close collaboration between MARAH, rice stakeholders, and AGRA. The results of this report could 1) inform the areas for investment in the rice value chain, 2) guide in national planning and budgeting, 3) assist MARAH's strategy to mobilize external resources and 4) inform private investment along the rice value chain to achieve efficiency.

1.2. Rationale

The rice sector is key to the economic development and food security of Burkina Faso. The expansion of rice production has been identified as a strategic issue within the National Food Security and Rural Development policies and strategies in the country.

Burkina Faso has a huge potential for lowland rice production. Although widely produced, it covers less than 10% of the estimated 500,000 hectares of lowland area (Government of Burkina Faso, 2011). The yields reported are also low, ranging from 1.3 tons/ha in non-developed lowland to 2.5 tons/ha in developed lowland, against an estimated potential 4 tons/ha. The lowlands account for 67% of the rice land area but supply only 42% of total rice production.

In cognizance of the increasing demand and the idle production potential to close the gap between rice production and consumption, the government and its partners have over the years developed numerous rice policy options and strategies and implemented various projects to support the rice value chain in the country. The study reviews the best policy options for the rice value chain as discussed in the following chapters.

A ten-year strategy called the National Rice Development Strategies (NRDS) was implemented. Implementation of the NRDS I ended in 2018. The NRDS I interventions focused on financing the establishment of irrigation schemes to increase production,

support for access to improved seed, machinery, fertilizer, and support to producer organizations. Government interventions have seen a marked increase in the use of improved seed and application of fertilizers. Evaluation reviews showed that actions taken during NRDS I implementation resulted in an average annual growth rate of around 14% in local rice production over the period. The government envisioned that the costs incurred in production, processing and marketing would reduce considerably, thus increasing local rice competitiveness relative to imports. It was projected that farmers would achieve a farm gate price of around 180 FCFA/kg for paddy, translating to an average consumer price of 350 FCFA for milled rice.

The Ministry developed NRDS II, in which the Government aims to increase production to 1,000,000 tons of paddy which led to the launch of the "one million rice" flagship. As part of the implementation, the government aims to intensify production, utilize idle land capacity, and increase local processing of rice. To strengthen local processing and reduce the export of paddy, the government had financed local rice processors to the tune of 1 billion CFA Francs in 2020 through the Agriculture Development Fund. The funding was aimed at enabling local millers to purchase rice from farmers on cash terms. A roadmap for the project is undergoing stakeholder consultations.

To be effective, the policy options shall address major challenges (e.g., lack of access to capital, low competitiveness, low productivity, poor storage, processing capacity and efficiency, market competitiveness, and transport infrastructure) facing the rice sector development in Burkina Faso. In this regard, this technical support focuses on key intervention areas that are best adapted to the context of Burkina Faso and which could improve the rice value chain.

1.3. Main Objective

To analyze options to implement a rice import substitution policy on purchase and procurement and its welfare implications on the people of Burkina Faso (BF).

Specific Objectives

 Review of rice public policies in Burkina Faso, ECOWAS, Africa, as well as globally that promote the rice sector and highlight lessons learned.

Determine the legal and policy procedure for implementing an import substitution policy on purchase and procurement in Burkina Faso.

- II. Analysis of trends and forecasting of rice production, yield, area, import, and development of a food balance for rice
- III. Development of a detailed structure of the rice value chain in Burkina Faso and the linkages with regional markets (ECOWAS) and international markets.
- Determine the legal and policy procedure for implementing an import substitution policy on purchase and procurement in Burkina Faso.
- IV. Assessment of the expected impact of the import substitution policy on purchase and procurement and alternative policy options on the efficiency and competitiveness of the rice sector (value chain) in BF.

Explore the mechanisms that the government can use to implement an import substitution policy on purchase and procurement and alternative policy options that promote rice import substitution.

1.4. Structure of the report

This technical report is structured into six chapters. Chapter two assesses the rice policy landscape in Burkina Faso from independency to now and reviews rice importation policy options. Chapter three discusses the trends and forecasts for rice production and a rice balance sheet. Chapter four highlights the structure and mapping of key actors along the rice value chain. The ex-ante impact analysis of different rice policy options on production, exports, producer prices, household consumption and poverty are discussed in chapter five. Chapter six concludes with policy recommendations.

2 Rice Policy Landscape Assessment

This chapter provides a background of the evolution of rice policies in Burkina Faso from independence (1960) to current. The rice policy landscape can be divided into seven periods as shown in Figure 1. The share of rice imports for consumption is shown in Figure 2.

2.1. The pre-crisis period: From 1961 to 1970

Soon after the independence of Burkina Faso, the new elites launched new agricultural development policies and initiatives to promote irrigation. The Technical Assistance Company



Figure 1: Periodic timelines of the Rice policy options.

Source: Authors' compilation



Figure 2: Share of rice imports in rice consumption Source: Author compilation based on FAOSTAT data

(SATEC) in collaboration with Taiwan and China began a vast operation to build small dams on rivers to promote rice production (Yameogo et al., 2019). This collaboration led to the establishment of the Kou Valley and Mogtédo perimeters in 1963. Other irrigation schemes developments were done and include the Louda dam (188 ha) in 1968, and Boulbi (75 ha) between 1968 and 1970.

The irrigated rice yields in Burkina Faso increased to 2-3 tons per hectare. It was during this period that irrigated rice cultivation was given priority in public policies. However, the actions implemented during this period were exclusively oriented towards the production link. Rice production was mainly intended for self-consumption which resulted in a downward trend in the share of imports in rice consumption to almost zero during this period (see Figure 2).

2.2. The crisis from 1971 to 1980

The 1970s were marked by waves of drought that caused food deficits. These deficits were filled by massive imports of foodstuffs, particularly rice. To mitigate the adverse effects of the crisis, the Government of Burkina Faso took several policy measures, such as 1) strict control of the domestic grain trade between 1974 and 1987, and 2) the creation of the General Equalization Fund (CGP) for rice in 1978. The CGP had a monopoly of rice imports and set producer and consumer prices.

This is a pivotal period marking a break with the previous period. The share of imports in consumption increased significantly to almost 50%. During this period (1973), the government implemented a vast operation called "Development of the Volta Valleys" (AVV) with the support of China aimed at increasing domestic agricultural production. This new bilateral cooperation made it possible to continue the development of the Kou Valley and created new rice-growing areas in Karfiguéla (1975-1977) and Banzon (1977-1981). In 1971, an initiative within the Ministry of Rural Development was created to support rice policies. In addition, the rice sector was given a prominent place in the second five-year plan (1972-1976). The initiatives had limited effects in terms of food sovereignty (Hirsch, 1998). This period favored massive rice imports that crowded out local rice production initiatives.

2.3. Public Intervention from 1981 to 1994

In the early 1980s, the rice sector experienced strong state intervention with the arrival of President Sankara into power in 1983 inspired by the Soviet model (Yameogo et al., 2019). The Government of Burkina Faso engaged in populist rhetoric to mobilize the population around their ideal (Dumont, 1993; Bethemont et al., 2003). The authorities initiated the Sourou project, which aimed to develop 40,000 ha of irrigated land to produce 120,000 tons of grain (Zoungrana et al., 2009). Until the end of the revolution in 1987, only 2.5% of the initially announced development objective was achieved. Following Sourou, the major rice project in Bagré was launched in 1989. The main objective of this project was to develop 30,000 ha of land, including 7,400 ha by gravity irrigation.

In addition to infrastructure, agricultural policies have also had a knock-on effect. Between 1992 and 1997, an incentive (better purchase price per kilogram) for rice production resulted in an increase in the area under rice from 25,000 ha to 53,600 ha (all types of rice production combined) (MAHRH, 2004).

However, all these initiatives were paused from 1991 onwards following the advent of the Structural Adjustment Programs (SAP). The State was forced by the International Monetary Fund and/or the World Bank to disengage from the production sectors and leave the initiative to private actors. The authorities in Burkina Faso abandoned proactive policies and left the sector to the free forces of market of supply and demand (Nubukpo, 2011).

2.4. Liberalization from 1995 to 2006

The effective liberalization of the rice sector in Burkina Faso occurred in 1996 following the abolition of the CGP. This resulted in a change in the strategy for promoting the rural sector, and rice cultivation.

The Government of Burkina Faso formulated policy guidelines that focused on trade liberalization and encouraged the participation of the private sector. The authorities allowed traders to import rice, which resulted in a substantial increase in imports. Rice imports tripled in the space of 10 years, rising from 137,185 tons in 1998 to 305,180 tons in 2006 with market values of 26.8 billion and more than 37.8 billion CFA francs respectively (SNDR, 2011). The policies and regulations during the liberalization are presented in Table 1.

The introduced policies and regulations did not trigger the local rice production to flourish and did not result in the reduction of rice imports. The share of imports in consumption has remained highest in the ECOWAS zone (Figure 2).

2.5. The food crisis from 2007 to 2011

Increases in food prices, particularly the price of rice, during this period led to riots that threatened the very existence of the political regime. A 50 kg bag of rice that used to sell for CFA Francs 9,000 on the market rose to CFA Francs 15,000 (CIR-B, 2015). This situation raised concerns about the success of liberalization policies and the structural adjustment programs. In the spring of 2008, the World Bank acknowledged its responsibility in the dismantling of agricultural policies in Africa, which amplified the perverse effects of the global food crisis (Nubukpo, 2011).

During the crisis period the government adopted and implemented a series of regulatory and policy instruments to encourage rice production, mitigate the adverse effects of the food crisis and ensure sustainable food security for the country. These measures include both cyclical and structural measures.

Cyclical measures include: 1) The removal or reduction of customs duties and VAT, 2) The control of market prices, 3) Sales of cereals at reduced prices through the *SONAGESS* model stores, 4) implementation of fertilizer and seed subsidies for producers and 5) The introduction of a floor price of 128 & 340 CFA Francs per kg of rice for producers and consumer price respectively (2009). Again, the introduction in 2011 of a ceiling price of 340 CFA Francs per kg for consumers of imported rice and 300 CFA Francs per kg for consumers of local rice.

Since 2008; the structural measures consisted of the development and implementation of the National Rice Development Strategy (SNDR) which aimed to sustainably increase national rice production and improve quality to meet the needs and requirements of consumers. Based on this strategy, the government of Burkina Faso requested support from Taiwan and China for

Time period	Policy & Regulation introduced
1998-1999	The elaboration from 1998 to 1999 of a strategic orientation document leading to a strategic orientation plan translatable into programs and Action Plans.
1999	The imposition in 1999 of a minimum import quota of 1,000 tons per transaction by the Ministry of Commerce
2000	The implementation of an Action Plan for the Rice Sector (improvement of rice production and productivity) over 15 years
2003	The implementation of the Rainfed Rice Project (PRP) since 2003 and the Lowland Development Project in the Southwest (PABSO).
2004	The adoption of the Rural Development Strategy Document

Table 1: Policies and Regulation introduced during liberalization period (1995-2006)

Source: Authors' compilation

the implementation of the second phase of the Rainfed Rice Project (2009-2013).

The 2008 crisis revealed profitable opportunities for the rice sector. Due to the price effect, the share of imports in rice consumption fell substantially from 2008 onwards. Rice imports have gradually fallen to 150,000 tons per year, allowing local rice to compete with imported rice. Also, the introduction of fertilizer and seed subsidies for producers has had positive effects, allowing rice production to increase threefold between 2007 and 2008.

2.6. The post-food crisis period from 2012 to 2019

The post-crisis period resulted in several initiatives to support the rice sector. It is particularly marked by the continued implementation of the SNDR. This period also saw the implementation of the third phase of the PRP (2014-2018) and that of the Shallow area Management Project in the Southwest and Sissili (PABSO-2012-2016). Thanks to these initiatives, more than 19,000 ha of lowlands were developed throughout the country by 2015, contributing to about 20% of the national rice production.

Since 2015, a new development framework was introduced in Burkina Faso. The new national guidelines for rice are included in the National Rural Sector Program (PNSR II), which is the rural component of the National Economic and Social Development Plan (PNDES) and which also stems from the "agro-sylvo-pastoral production 2016-2027" sectoral policy. The PNDES enhances the structural transformation of the economy through industrialization in the agricultural sector.

The government favored local rice products purchases by concretizing its choice through the issuance of Order No. 2017-002/PM/CAB of January 31, 2017, on the purchase of local food products by state institutions. Through this order, the State invited all its institutions (school canteens, National Center for University Works (CENOU), Hospitals, military barracks, prisons, and correctional facilities, etc.) to give preference to local products including rice in their procurement. The measures made it possible to increase paddy production, which was estimated at 325,138 tons in 2016/17. The share of imports in rice consumption fell significantly during this period, becoming lower than that of ECOWAS without Nigeria (see Figure 1).

2.7. The crisis period from 2020 to the present

Despite the implementation of all these policy measures, rice imports over the 2012-2019 period amounted to 7,879,324 tons, or a monetary equivalent of approximately 690.3 billion CFA Francs in foreign currency outflows (FAOSTAT, 2019). Based on this observation, the Burkina Faso authorities have decided to develop a second-generation National Rice Development Strategy (NRDS II) for the period 2021-2030, which is in line with axis 3 of the National Economic and Social Development Program (PNDES).

In 2020 the government adopted the National Rice Development Strategy II (NRDS II; 2021– 2030) to address the challenges in the rice sector and to meet the country's demand for white and parboiled rice. The overall objective of the second strategy is to satisfy national demand for rice in terms of quantity and quality. The strategy has two phases. The first phase (2021–2025) aims at accelerating production to achieve 1 million tons of paddy during the 2020–2021 agricultural season and continue increasing production to achieve self-sufficiency. The second phase (2026–2030) will consolidate the gains from the first phase to produce enough rice for security stock and surplus for export (CARD 2021).

The Burkina Faso authorities launched the presidential initiative in 2020 named: "Produce one million tons of paddy". To support this initiative, the government plans to introduce an import quota policy to reduce the country's dependence on rice imports. To boost local production as well, the authorities have launched a new initiative to offer credit solutions to processing units in the Bagré irrigated plain, an area in the east-central part of the country that is struggling to attract investors, according to a study by the European Center for Development Policy Management. This initiative is supported by an agreement signed between the Agricultural Bank of Faso and the promoters of the plain of Bagré. As a result, eight processing units were granted credit ranging from 16 to 250 million CFA Francs to buy paddy rice.

However, the positive effects of these government measures are likely to be affected by the adverse effects of the covid-19 crisis and the Russia-Ukraine crisis. The combined effects of the two crises have led to an increase in the cost of inputs (fertilizers, plant protection products, packaging, etc.), detailed parts and equipment, which impact on the competitiveness of local rice in Burkina rice.

2.8. Review of policy options for rice importation

Following the various policy options the Government implemented, the rice imports to Burkina Faso have increased over time. What policy could Burkina Faso implement to ensure access to competitive rice products for the citizens? There are various policy options to ensure Burkinabe's rice products are 1) competitive and hence support import substitution. This section shall infer from various case studies within and without Africa on possible policy options including import substitution.

2.8.1 Rice Import Substitution - Case Study and lessons from Global practices

Import substitution refers to replacing imports with products from domestic industries (Malcolm et al., 1998). This strategy was implemented as early as the 19th Century by both the United States and Russia after the emergence of England as the leading manufacturing power (Regnault, 2013).

Other countries in Latin American countries such as Argentina, Brazil, Colombia, and Mexico advocated the replacement of imports with domestic products to reduce dependency and promote the development of local industries. After gaining independence, many African countries also embarked on the path of import substitution resulting in mixed effects. However, India had a relatively successful policy as discussed below.

India

India is the second largest producer of wheat, rice, and food staples around the globe (FAO 2014); and is famed by the inward-focused trade strategy which is known as import substitution. Import substitution is a trade policy which promotes economic growth by restricting imports that compete with the domestic products in developing countries. It aims to substitute externally produced goods and services with locally produced ones which will in turn protect small industries. In 2008, export of rice, wheat with other commodities were banned to satisfy domestic needs in India but was later elevated to exports while considering the surplus production and demand available in the global market after 2016. There was a significant increase in the level of production that is about 217 million tons in 2006-2007 to 275.11 million tonnes in 2016-2017. As the country witnessed drought in 2009, 2014 and 2015, this did not affect the food-production. At that time the country was both self-sufficient and had enough surplus for exports. The import substitution policy spurred growth in rice production in India. Ministry of Agriculture of India reported the final estimation for 2015-16 stating, the production of major cereals in particular rice, bajra and maize yielded 104.32 million tons, 21.8 million tons and 8.08 million tonnes respectively. Besides, India is not only the largest producer of cereal but also one of the largest exporters of cereal products in the world. Exports of cereals in India stood at Rs47,287.12 crore / USD 6,611.09 Million throughout 2019-20, where Rice accounted for approximately 95.7% which is a very significant share in India's total cereals export. Rice produced in India till today has a large presence of consumers within the nation and throughout the global market.

There are certain set of measures which are taken by the government of India in view for Import substitution of agricultural produce to increase demand for domestic products and to restrict the import of several agricultural commodities into India. The restrictions include the following:

- 1. India's commitment on tariff restraining: Tariff is a significant tool to balance between domestic agricultural industry and market access. These tariffs lay down quotas by allotting low or no duties to imports up till a certain volume and to add on high rates for overtaking predefined import mark. India does constrain its tariff rates on agricultural import as committed in GATT (General Agreement on Tariffs and Trade). The average Indian agricultural bound tariff is 113.5% which is the highest in the world. India's average bound tariff rate of agricultural products is noticeably greater than its average bound rates for nonagricultural products.
- 1. **Restrictions on import of agricultural produce:** A physical restriction on import or ban is used to prevent import of selected agricultural produce. These restrictions are done by imposing high-rate quotas. Certain restrictions/ban were imposed on several agricultural products imported by India.
- 2. **Custom Import Duty:** Custom Import Duty is tax which is charged on all goods that are imported into the country. Recently the government of India raised the import duty on wheat from 30% to 40%. This step was taken to encourage the demand for domestically produced grains and other agricultural products.
- 3. *Financing in Agricultural sector:* Financing in the agricultural sector by India proved to be important for encouraging import substitution in the country. The financing aims at reduction of agricultural waste, a high rate of value addition, competitiveness in global market as well as to raise productivity of the agricultural sector.

Import substitution is a significant policy which aims at an increase in utilization as well as demand for the nation's own produce in an effective way such as to reduce wastage of own produce and to increase export percentage. Import substitution also faces various challenges which could be mitigated. Some of the lessons from India are as follows:

- Industries as well as the government should encourage the engagement of research and development in the agricultural sector for uplifting the quality of the agricultural produce and invention of new products.
- Industries with well-defined cost advantage should be enrolled in the import substitution program.
- Cost and quality control components are significant when undertaking import substitution.
- Justifiable protection of the industry should be extended to the domestic producers as negotiations with the global market players are ongoing.

2.9. Comparative analysis -Effects of rice policies in selected West Africa countries

There are several effects of the rice policies in West Africa countries and include: 1) policy paradigm shift and rice dependency; 2) Heterogeneity of the rice sector in ECOWAS; 3) Import regulations for rice in ECOWAS countries.

i). Policy paradigm shift in Burkina Faso and the increase in rice dependency

During the pre-crisis period (1961-1971), the share of imports in rice consumption was relatively low in West Africa. Burkina Faso's share was below that of ECOWAS. This weakness is explained by the fact that rice was not sufficiently anchored in the eating habits of the Burkinabe (Figure 2).

The great drought of the 1970s favored rice imports in West Africa. ECOWAS countries resorted to massive rice imports to make up for food deficits. The share of imports in rice consumption represented 40 to 50% of total consumption. The increase in the share of imports in rice consumption is much faster in Burkina Faso.

After the great drought of the 1970s, West African countries implemented vast rice programs inspired by Asian countries (highyielding varieties, irrigation, fertilizers, etc.). However, in Burkina Faso, these policies did not reduce rice dependence compared to other ECOWAS countries. This situation can be explained by the ineffectiveness of the implementation of customs duties. For example, to significantly reduce its imports, Nigeria instituted an embargo on rice imports starting in 1985, which, although it was not fully respected, nevertheless resulted in a significant drop in imports (Akpkodje, 2002).

West African countries were subject to SAPs because of the budget deficits and high debt levels observed in the 1970s. ECOWAS countries were forced to liberalize all productive sectors, particularly the agricultural sector, and to promote the opening of the economy. From 1994, the countries of the franc zone experienced a devaluation of the currency and at the same time Nigeria lifted the embargo on rice imports. This situation has maintained the rice dependency of West African countries, which fluctuates between 40 and 50%, with a peak of over 100% in Burkina Faso. This situation can be explained by the phenomenon of re-exporting rice to the north of Côte d'Ivoire, which was affected by the rebellion.

The rice dependency of West African countries began to decline considerably following the 2008 food crisis. This crisis called into question the liberal policies advocated by the Breton Wood institutions and accentuated measures to support the rice sector in West Africa. These measures to support local rice production have helped to curb their rice dependency curve to less than 40% in ECOWAS, but still high compared to the level of the 1960s. In Burkina Faso, on the other hand, rice dependency has declined to a lower level than in 1961. This reflects the relative effectiveness of rice policies implemented in Burkina Faso after the 2008 food crisis.

ii). Discrepancy in the rice sector in ECOWAS countries

The growth of the rice sector at the ECOWAS level hides huge disparities. The Figure 3 provides an overview of these disparities in 2019.

The first group of countries are those where rice occupies a major place in dietary habits, with an average annual consumption of more than 100 kg per capita, (Côte d'Ivoire, Guinea, Mali, Senegal, Guinea-Bissau and Benin). The level of dependence on rice imports in this category of countries is on the one hand where local production is the main source of supply (Mali, Guinea, and Sierra Leone) and, on the other hand where over 50% of rice needed is imported (Guinea Bissau, Liberia, Côte d'Ivoire, Senegal and Cape Verde). Benin imports nearly "200%" of the rice needed. Indeed, the situation in Benin could be explained by the re-export and smuggling of rice between Benin and Nigeria. Beninese traders ship rice to the port of Cotonou to their Nigerian counterparts. The rice is then stored before reaching local markets or being shipped to other countries in the region (Tondel, 2020).

The second group consists of countries with populations that consume on average less than 50 kg of rice per year. In these countries, too, there is a disparity in rice import dependency. These countries include Nigeria, which has almost substituted rice imports, followed by Burkina Faso and Niger, where imports account for less than 50% of total rice consumption. Countries such as Togo and Ghana, depend on imports for almost all the rice supply.

This disparity can be explained by the diversity of rice trade policies in West African countries (Figure 4). Indeed, the differences in national rice policies and rice import regulations between countries explain scenarios in the rice sector in ECOWAS (Tondel, 2020).

iii). Import regulations for rice in ECOWAS countries

The import tariffs differ amongst ECOWAS countries despite the existence of a Common External Tariff (CET). Côte d'Ivoire has the same import tariff as Burkina Faso, at 10%. Nigeria (70%) and Ghana (20%) have the highest import tariffs (Figure 4).

Burkina Faso's import tariff level is low compared to other rice producing countries in the world.



Figure 3: Heterogeneity of thee rice sector in ECOWAS (2010-2019) (mean values)



Source: Author based on FAOSTAT data

Figure 4: Import Tariffs for Rice in selected countries

Source: Author manipulated based on data from ECOWAS Commission and Tondel et al., 2020)

Large rice exporting countries tend to have high import tariffs. This is particularly true of large Asian producers. In 2014, net exporting countries such as India, Thailand, and Vietnam had import duties of 70%, 52%, and 40%, respectively. Similarly, large Asian producers that also import significant volumes of rice like China, the Philippines, and Malaysia, had import duties of 65%, 50%, and 40%, respectively (Tondel et al., 2020).

2.10 Rice policies in selected ECOWAS countries – case studies

The case of Nigeria

Following the 2008 crisis, the Nigerian government formulated a series of policies aimed at boosting productivity and production in the rice sector and eliminating Nigeria's

structural deficit in the sector. In 2011, it launched the Rice Transformation Plan for the period 2011-2015 aimed at doubling rice production from 3.3 million to 6 million tons per year. The plan aimed to encourage the private sector to invest in large-scale milling operations in rice-producing regions through fiscal measures, investment promotions and appropriate infrastructure. These included tax breaks on imports of agricultural processing equipment, tax exemptions for agricultural processing investors located in newly created staple crop processing zones, and investments in supporting infrastructure, particularly roads, logistics, storage, and power (Ayinde et al., 2016; ADF, 2013). It also included reforms to increase the availability of agricultural inputs, agricultural finance, and agricultural mechanization.

This strategy contributed to a modest increase in rice production in Nigeria, but it failed to meet its targets as the gap between domestic supply and demand widened. The failure of these policies has been attributed to the lack of political support from the ruling coalition, weaknesses in the bureaucracy, and inadequate organization of the industry's stakeholders (Ayinde et al., 2016).

To limit the volume of imports and protect the domestic rice sector, the Nigerian government has imposed high tariffs on rice, although these vary widely over time, generally ranging from 30 to 70 percent. The Nigerian government has also imposed non-tariff measures, including periodic import bans restricting trade flows across land borders, particularly to control the re-export of rice from Benin. Together, these measures have been effective to some extent in reducing the flow of rice imports through Nigerian ports.

Tax exemptions and other incentives were introduced in 2014 to encourage private investment in rice production and processing. The tax measure distinguished between two types of rice importers: those operating one or more rice mills or investing in new production capacity, who would be subject to a 20 percent import levy for a certain quota, in addition to the normal import tariff; and those importing rice only, who would be subject to a 60 percent levy. This policy was intended to encourage importers to invest in the domestic rice sector while limiting imports to the volume needed to fill the gap between domestic production and consumption needs.

This revised rice sector policy, which offers lower import tariffs to operators who invest in domestic rice production and processing has had encouraging results (Agri trade/CTA, 2014). It reportedly generated new investments by local and international companies in rice production in July 2014.- For example, Dangote Industries announced an expansion of its rice sector investments from US\$300 million to US\$1 billion. Dangote Industries also plans to expand rice production in association with smallholder farmers, who will provide the raw material for the company and have an accessible market for their produce.

Highlights from Nigeria

 This lower import tariffs offered to operators who invest in domestic rice production and processing had reportedly generated new investments by local and international companies in rice production.

The case of Mali

The government of the Republic of Mali has long pursued a rice policy aimed at ensuring an adequate supply of local products for the country's consumption needs and improving the incomes of rural households. In Mali, the crisis period was an opportunity to implement the agricultural development strategy, a component of the economic and social development program (PDES). It aimed to produce a cereal surplus of over 900,000 tons in 2012. For the rice initiative, actions included irrigation projects, improved seed distribution, increased use of new technologies and implicit subsidies (through government intervention on price controls or terms of trade, for example) to the most efficient producers.

Mali has a well-developed rice sector, by regional standards, in terms of production, processing and marketing efficiency. This has been made possible by major investments by the state. In addition, the national rice market is supported by a consumer population that has a strong preference for locally produced rice. Following the 2008 crisis, the state maintained a policy of tightly controlling imports. Since 2000, Mali has applied the UEMOA (then ECOWAS) Common External Tariff (CET), which amounts to 10% for rice, in addition to other import taxes and duties. Given the 18% VAT, the protection of local rice in Mali would be around 32% of the CAF value of imports. If there is a risk of shortage, this protection is modulated by the government, either by suspending customs duties and/or temporarily eliminating VAT, or both, to limit the increase in consumer prices.

The government also regulates rice imports based on the level of coarse grain production. Each marketing year, the Malian government evaluates the gap between domestic production and demand and, on this basis, determines the amount of rice that the country must import during the year. If the domestic supply of rice is deemed insufficient by the national authorities, or in the case of circumstances deemed exceptional (Ramadan, lean season), the government grants exemptions from customs duties and VAT to traders (under specific conditions regarding the product imported, the tax base, the terms of distribution, as well as the timing). However, some observers point out that annual estimates of import requirements are often wrong, resulting in excess imports that disrupt the functioning of the domestic market, especially when farmers put their crops on the market.

With respect to trade in locally produced rice, although there is no official ban, which would be contrary to the ECOWAS trade liberalization program (SLEC), government authorities frequently ban grain exports unofficially.

Key highlights from Mali:

- The government regulates rice imports based on the level of coarse grain production.
- Each marketing year, the Malian government evaluates the gap between domestic production and demand and, on this basis, determines the amount of rice that the country must import during the year.

The case of Senegal

Senegal's experience is instructive because it shows an alternative approach to the development of the national rice sector to that followed by Southeast Asian countries such as Indonesia. It is also relevant because of the geographical and institutional similarities between this country and other West African rice producers. In 2012, the government reaffirmed a strong commitment to rice production, with the goal of achieving self-sufficiency in response to the 2008 food price crisis.

Like many West African governments, Senegal is implementing a National Rice Self-Sufficiency Program (PNAR) that sets production targets of 1,600,000 MT of paddy (corresponding to 1,080,000 MT of white rice) to fully meet national demand. These objectives are defined in the Senegalese Agriculture Acceleration Program (PRACAS), the agricultural component of the Emerging Senegal Plan. This program includes incentives such as subsidies on agricultural inputs and equipment, debt forgiveness, and the development of new areas.

The efforts of the government and value chain actors to achieve rice self-sufficiency in 2017 resulted in a sharp increase in rice production. Unfortunately, this success has been accompanied by difficulties in selling white rice. Several reasons are given to explain these problems: 1) A dispersion of production (mainly from small producers) throughout the region with almost no consolidation mechanism; 2) The lake of an appropriate financing mechanism for rice farmers enabling them to obtain quality paddy, plan their production and sell it regularly in a controlled distribution scheme; 3) The predominance of broken unscented rice imported from India; and 4) The preference for broken rice and consequently the difficulties of marketing whole, unscented rice by Senegalese.

Faced with this situation of poor sales of the 2014 winter season's production, the Senegalese Ministry of Trade, the National Company of Development and exploitation of the Lands of the Senegal River Delta and the Valleys of the Senegal River and the Faleme (SAED), as well as the Interprofessional Rice Committee (CIRIZ), rice importers and distributors, and the National Bank of Economic Development (BNDE) signed a memorandum of understanding on the marketing of Senegalese rice in March 2015. This protocol agreement was subsequently operationalized in the form of a rice marketing platform in Senegal. This platform is a structural response to difficulties in selling local rice. The three elements are central to the regulation mechanism in Senegal:

- To make it possible for the protagonists to reach an agreement on the marketing of local rice, the Ministry in charge of trade is facilitating discussions between SAEDapproved rice farmers and importers. These discussions are centered around the general conditions of price setting.
- The mechanism provides for a distribution of local rice purchases according to the volume of imported rice. Thus, each importer commits to purchasing the two categories of rice in proportion to its market share of imported rice.
- The BNDE and SAED facilitate the implementation of the regulation. Indeed, the BNDE is committed to facilitating local rice marketing operations, by setting up lines of credit for the benefit of importers. In addition to approving rice growers, SAED is responsible for providing regular statistics on rice production in the valley (quantity and quality) as well as the periods of arrival on the market.

Key highlights from Senegal:

- To ensure a dynamic regulatory mechanism, imports are regulated according to national consumption needs and in proportion to the market share of each importer.
- Regular meetings are held to set import quotas.
- Given the sensitivity of the product, the government reserves the right to authorize exceptional imports in the event of market tensions or to set up a safety stock.
- The results of the implementation of the Senegalese rice marketing protocol are largely positive.

2.11 Lessons learned from import substitution policy experiences

Import substitution is a development strategy whereby a technologically disadvantaged economy attempts to accelerate industrial investment primarily for the domestic market by relying heavily on government intervention on market prices, barriers to entry, and access to imports and financing. The intention is to induce investment by improving the risk-benefit ratio. One of the advantages of import-substituting industrialization is there will be the creation of new jobs to substitute the imported products, therefore the country must increase the number of industries.

Lessons learned from the experiences of implementing this strategy in Africa show that:

- One effect of the import substitution strategy is that it raises relative prices for the targeted product. These increased prices help spur domestic production, which is good for rice producers. But what this also means is that everyone who consumes rice has taken a loss due to the policy thus the price increases result in loss of welfare for rice consumers.
- The import substitution policy should be implemented with the continuous desire to develop exports of manufactured goods and not self-sufficiency.
- Industries as well as the government should encourage the engagement of research and development in the rice sector for uplifting the quality of the rice and invention of new products.
- 4). Industries with well-defined cost advantage should be enrolled in the import substitution program.
- 5). Cost and quality control components are significant when undertaking import substitution.
- 6). The implementation of innovative financing mechanisms promotes the supply of raw materials.

- 7). It takes time to move from a low level of productivity to a higher level. It takes time to increase yields, develop high quality milling capacity, and it takes time to build a reputation. Therefore, the policy shall not yield result overnight. The results will take time to manifest.
- The establishment of a monitoring and evaluation system to produce regular statistics facilitates informed decisionmaking.

Conclusion and Recommendations

For the rice import substitution policy to be deemed a success, increase in welfare from the enhanced rice production/productivity, and the revenue from tariffs, should be more than the loss of welfare because of increased price of rice. Normally, the welfare loss is typically greater than the welfare increases from a tariff *ceteris paribus*. Unless something else changes, tariffs typically result in overall welfare losses. Therefore, the productivity in the rice value chain would need to increase enough, to make up for the welfare loss from the tariffs on imported rice. Consequently, increased productivity associated with quality and quantity should eventually result in prices lower than their import competitors; however, this takes some time.

Recommendations

- The protectionist policy should only be encouraged to increase productivity so that the country exports more and NOT to attain self-sufficiency.
- Import substitution is a significant policy which aims at an increase in utilization as well as demand for the nation's own produce in an effective way such as to reduce wastage of own produce and to increase export percentage. Import substitution also faces various challenges which could be mitigated.
- Cost and quality control components are significant when undertaking import substitution. Therefore, Industries as well as the government should encourage the engagement of research and development in the agricultural sector for uplifting the quality of the agricultural produce and invention of new products.

3 | Food Balance Sheet of Rice, Analysis of Trends and Forecast

As mentioned in the preceding chapter, Burkina Faso's demand for rice has been partially met through local production, achieving a 53% selfsufficiency rate in 2019 (FAO, 2022). However, the country's reliance on rice imports exposes it to the volatility of global market prices and external shocks. Burkina Faso has been compelled to engage in significant and costly rice imports annually, thus diverting resources from other vital development projects. In 2015, the country imported 273,612 MT of rice, amounting to 40 billion CFA francs, to meet the local consumption demand (FAO 2016). It is further projected that rice imports could cost the nation up to 107 billion by 2025 (DGESS/MAAH, 2016).

Given these circumstances, it becomes imperative to assess the prevailing demand trends and forecast future rice demand to formulate workable policies aimed at enhancing self-sufficiency and surplus for exports. Additionally, estimating the Food Balance Sheet for rice offers a comprehensive overview of Burkina Faso's rice situation by summarizing supply, demands, sources, and future trends. This information is invaluable in guiding strategic decision-making and resource allocation to improve domestic rice production and reduce reliance on imports, ensuring greater food security and sustainable agricultural development.

3.1 Methodology

3.1.1 Data sources

The primary data from the Ministry of Agriculture in Burkina Faso was used. It included crucial information such as the area under production, volume produced, volumes imported, and the cost of importation. Trend analysis was conducted using data spanning from the year 1984 to 2020, while forecasting up to the year 2028 to provide insights into future developments and potential scenarios.

3.1.2. Analytical models

Several regression-based techniques exist for demand trend analysis and forecasting, (Linear Regression, Simple Moving Average, Weighted Moving Average, Exponential Smoothing, and Winters' method) but the choice depends on data availability, required level of detail, and the specific context of the food balance sheet analysis.

In this study, we opted for Exponential Smoothing methods, which are empirical techniques for forecasting time series. These methods are easily interpretable, and their recursive implementation makes them efficient for handling large datasets. However, it is important to note that although widely used, Exponential Smoothing lacks the solid theoretical foundations of methods like ARMA, ARIMA, and SARIMA. Nevertheless, the literature acknowledges the merits of Exponential Smoothing, which is widely employed in Ministry of Agriculture forecasts in various countries, including the US, Canada, Australia, China, and India, to predict future trends in agricultural production and other relevant factors. In Africa, it has been utilized in countries such as Kenya, Ethiopia, Nigeria, Ghana, Uganda, and South Africa for agriculture forecasting. Its simplicity, ease of implementation, and ability to handle time series data make it a valuable tool for forecasting agricultural variables.

Forecasting methods were developed during the second half of the 20th century, introduced by Holt in 1958, Winters in 1960, and popularized by Brown's book in 1963. Smoothing methods encompass a set of empirical forecasting techniques that assign varying levels of importance to past values of a time series (Lagnoux, 2013). These methods have wide distribution and usage due to their simplicity and the quality of the forecasts they provide. All these methods involve adjusting a local estimate of a time series column's future value based on specific variants, including a constant for simple exponential smoothing, a line for double exponential or Holt smoothing, and polynomial or periodic functions for more general smoothing.

3.2. Trend Analysis

3.2.1. Trend analysis of rice production

The Figure 6 illustrates the trend in rice production in Burkina Faso from 1984 to 2020, displaying a positive production trajectory over the years. Notably, there was a decline in production between 1997 and 2007; however, this was subsequently followed by a remarkable period of almost exponential growth from 2007 to 2020. This notable surge in production can be attributed to the substantial support extended by the government and its partners to the rice sector since 2008, particularly in response to the food crisis.

3.2.2. Trends in rice acreage and yields

The trends in both acreages under rice production and rice yields for the period 1984-2020 are depicted in Figure 7. The acreage



Figure 5: Trends in rice production in Burkina Faso (1984-2020)

Source: Author relied on data from Ministry of Agriculture



Figure 6: Trends in average rice acreage and yields Source: Author relied on data from Ministry of Agriculture





under cultivation exhibited a generally positive trend, except for a decline observed between 1997 and 2008. However, from 2008 onwards, there was a notable upswing in the acreage dedicated to rice cultivation. On the other hand, the trends in rice yields displayed considerable variability throughout the years.

The observed increase in rice production is primarily attributed to the expansion of cultivation areas rather than significant improvements in yields. This can be attributed to the limitations faced by most producers in investing in advanced production technologies that could substantially enhance yields. As a result, there is a relatively low use of quality inputs and a limited adoption of Good Agricultural Practices (GAP) among the rice producers. These factors have contributed to the challenges in achieving substantial yield improvements in rice production.

The results suggest that while there has been progress in increasing rice production through expanded cultivation areas, achieving significant yield improvements may require addressing the limitations faced by rice producers in adopting modern agricultural practices and technologies. Encouraging the adoption of GAP and promoting the use of quality inputs could be potential strategies to enhance rice yields and further strengthen the rice sector in Burkina Faso.

3.2.3. Trends in rice imports and prices

The trends in import volumes and nominal prices of rice are depicted in Figure 8. Notably, there was a decline in the volume of rice imports between 2009 and 2010, which was followed by a sustained increase until 2013. Conversely, nominal prices showed an upward trend from 2009 to 2012 and then experienced a dip from 2012 to 2018.

The decrease in prices during the period from 2012 to 2018 contributed to an increase in the volume of rice imports from 2014 to 2018. This suggests that lower prices lead to higher import volumes during that timeframe.

3.2.4. Main sources of imported rice

Most rice imports into Burkina Faso originate from countries outside the Economic Community of West African States (ECOWAS), with Asia having a market share of 90% followed by North America with 6%. The imports from ECOWAS countries and Latin America contributed 3% and 1% respectively as indicated in Figure 8.

Specific export share of rice to Burkina Faso is also shown (Figure 9). Over the period 2005-2018, only a mere 1% of imports came from the sub-region, specifically from Côte d'Ivoire, indicating an underdeveloped subregional rice market. Notably, Thailand and India stand out as the predominant sources of



Figure 8: Origin of rice imports in Burkina Faso (1994 to 2020)



Figure 9: Specific export share of rice to Burkina Faso Source: Customs data

rice imports, accounting for 25% and 27% of total rice imports, respectively, with Myanmar ranking third at 15%. This can be attributed to producer assistance and export support policies implemented in Thailand and India, enhancing their price competitiveness in the rice market. Notably, Thailand provides price incentives for rice production, while India offers subsidies for irrigation water pumps (Tondel, 2020) all of which boost rice production. Such structural factors indirectly influence rice imports from West African countries, particularly Burkina Faso. Rice importers in Burkina Faso favor these countries not only to maximize their profit margins but also to offer lower-cost rice to consumers. Additionally, the West African market serves as a commercial outlet for Thailand and India to dispose of their rice surpluses, often comprising older stock (Tondel, 2020). This situation sheds light on the critical issue of food and nutrition insecurity in Burkina Faso, necessitating urgent attention and strategic interventions to enhance domestic rice production and strengthen the sub-regional rice market. Addressing food insecurity is paramount to ensuring the well-being and resilience of Burkina Faso's population.

3.3. Projections Analysis

The forecasting results obtained are compelling and provide a glimmer of hope, as various analyzed variables demonstrate a positive trend. However, it is important to acknowledge that the predicted values do not account for potential external global shocks, such as the COVID-19 pandemic or the Russia-Ukraine conflict. These unforeseen events can significantly impact the accuracy and reliability of the forecasts, making it essential to approach the projections with caution and adaptability to changing circumstances.

3.3.1. Forecasting rice Production

The forecast indicates a projected steady growth in rice production (Figure 11). By 2028, production is expected to reach 747,000 MT in the most optimistic scenario. However, it's important to note that this level of increase is still significantly below the target set by NRDS of 1,629,000 MT by 2025.







Figure 11: Projected rice production (MT) after development of 50,000 HA

Source: Ministry of Agriculture

To bridge this gap and achieve the desired production target, efforts should focus on increasing the productivity of rice farms. This can be accomplished by promoting better access to quality inputs and encouraging the adoption of Good Agricultural Practices (GAP). By implementing these measures, rice farmers can enhance their efficiency and yield potential, contributing to the realization of the ambitious production goal set by NRDS.

As part of the AGRA-supported "Produce a Million MT of Rice" initiative, there is a plan to irrigate approximately 50,000 ha of rice fields. This inclusion of irrigated areas has a positive impact on rice production forecasts. Using a linear function with a constant production based on the average yield of 5023 kg/ha and an additional 50,000 ha, we project a consistent production of 502,300 MT over the years 2025 to 2028 (Figure 12). However, when considering the smoothing function, we observe a trend with the following equation:

Where y is the expected production and x is the year with an $R^2{=}0.9017$

From this equation, and considering the adjustment shock, it appears feasible to achieve

the target of one million MT of paddy rice within 6-7 years. The introduction of irrigation to the rice fields is expected to enhance production stability and contribute to achieving the production goals, thus underscores the importance of sustainable agricultural practices in meeting the ambitious targets for rice production.

3.3.2. Forecasting acreage under rice cultivation

The Figure 12 illustrates the forecast for the acreage under rice cultivation. The projections indicate a potential increase in acreage ranging from 169,630 hectares to 305,690 hectares, with a 95% confidence interval. This forecast suggests a potential rise of approximately 18% in acreage under rice production compared to the levels observed in 2020 which signals potential growth in rice farming activities in the specified region or period. The projected increase in acreage under rice could lead to an overall increase in rice production, contributing to food security and potential surplus for export or trade. This will further stimulate growth in the agricultural sector, creating opportunities for farmers, businesses, and employment in rural areas.



Figure 12: Forecast of acreage under cultivation.

Source: Author relied on data from Ministry of Agriculture

3.3.3. Forecasting average rice yields

The forecast for average yields is presented in Figure 13. Over time, this forecast shows a tendency to stabilize, with yields fluctuating between 915 Kg/ha and 2208 Kg/ha. Throughout the forecast period, the yields remain relatively constant, supporting our assumption that the increase in production is primarily attributed to the expansion of acreage under cultivation. The relatively constant yields throughout the forecast period suggest that the gains in rice production are not primarily driven by improvements in productivity. Instead, the increase in production is mainly attributed to the expansion of acreage under rice cultivation. This raises the question about potential limitations or constraints in achieving higher productivity. Identifying and addressing these limitations could be crucial in unlocking further yield enhancements.

3.3.4. Forecasting import costs (CFA Francs)

The forecast for the cost of imports indicates an upward trend. To mitigate the rising costs and reduce dependency on imports, Burkina Faso must focus on increasing rice productivity and fostering self-reliance in domestic production with surplus for export. Achieving this goal requires the development of effective policies and strategies that support and promote improvements in local rice production. Some of the production enhancing techniques includes improved agricultural practices, technology adoption, and research-driven approaches, through which Burkina Faso can boost domestic production. This, in turn, can help reduce the reliance on costly imports.

The upward trend in the cost of rice imports in Burkina Faso calls for a strategic approach to bolstering domestic production. By focusing on productivity improvements and fostering selfreliance, the country can reduce import costs, enhance food security, and build a resilient agricultural sector. Well-designed policies, investments, and supportive measures are vital to achieving these objectives and ensuring sustainable growth in the rice sector.

3.4. Rice Balance Sheet

A food balance sheet comprises six main components: availability, needs (demand), gross surplus (the difference between availability and needs), trade balance (import, aid, and export), net surplus, and the apparent available rice per capita. This section discusses trends and projections of these different balance sheet components for rice.

Cereal (Rice and Wheat) supply and demand balances for Burkina Faso as of June 2023 is shown in Figure 14. The figure depicts a deficit of above 45% which will be filled by rice imports. The last five years had a lower average production at 258000MT.



Figure 13: Forecast of rice yield (KG/HA)

Source: Author relied on data from Ministry of Agriculture

BURKINA FASO

	Wheat	Rice	Coarse grains	Total cereals
2022/23 Domestic availability (000 tonnes)	5	295	4 740	5 030
2022 production	-	290	4 740	5 030
Expected stock drawdown	5	5	-	
2022/23 Utilization (000 tonnes)	288	645	4 761	5 684
Food use	288	624	3 549	4 461
Non-food use	-	20	1 007	1 027
Exports	-	1	25	26
Expected stock buildup	-	-	180	170
2022/23 Import requirements (000 tonnes)	283	350	21	654
Per caput consumption (kg/year)	13	28	157	197
2022/23 Comparison with the previous year and the recent aver	age			
Production (000 tonnes)				
Previous year's production	-	298	4 210	4 508
Previous five years' average production	-	258	4 414	4 672
2022 production compared to average (%)	-	112	107	108
Import requirements (000 tonnes)				
Previous year's imports	218	320	10	548
Previous five years' average imports	279	422	16	716
2022/23 Import requirements compared to average (%)	102	83	134	91
Additional information Population mid-2022 (000s): 22 674 Crop calendar (*major food crop)				
Maize* Millet*				
Rice				
Sorghum*	J F M J	MJ	J A S O	N D
Lean period		H		
Sowing				

Figure 14: Cereal supply and demand balances for Burkina Faso as of June 2023 – West Africa Source: FAOSTAT

3.4.1. Trend analysis of rice balance sheet

The trends in the rice balance sheet for Burkina Faso are depicted in Figure 16. The graphs indicate an overall upward trend in most areas, except for the gross surplus/deficit, which remains negative. This indicates an existing gap between the availability of rice and the response to rice demand. While availability demonstrates an upward trend, it still falls short of meeting the increasing demand observed between 2014 and 2021. Additionally, the per capita disposable income shows a positive trend, driven by the country's economic growth, leading to an expanding urban population, and evolving dietary habits.

Overall, the data highlights the importance of addressing the gap between rice availability and demand to ensure food security for the growing population. As per capita disposable income increases, there may be an opportunity to further stimulate demand and support the rice sector's development in Burkina Faso.



Figure 15: Trend representation of the food balance for rice in Burkina Faso Source: DGESS/MARAH

3.4.2. Forecast analysis of different components of the rice balance sheet

In this section, we concentrate on the forecast analysis of various components of the rice balance sheet. Each item was individually analyzed to identify its projected behavior by 2023. The forecast focuses on the following aspects related to rice: 1) availability, 2) demand, 3) surplus, 4) import/export balance, 5) net rice surplus, and 6) rice availability per capita. The analysis examines predicted values *ceteris paribus*, meaning it does not account for external global shocks, such as the COVID-19 pandemic or the Russia-Ukraine conflict. As a result, the forecast provides insights into the expected trends and patterns, assuming no significant external disruptions

Rice Availability

The Figure 16 illustrates the forecast of rice availability in Burkina Faso. According to the forecast, the availability of rice at the end of 2023 is projected to be slightly lower than it was in 2021. This indicates a decrease of 6.23%, with availability declining from 283,478 MT in 2021 to 265,807 MT in 2023. This suggests that there



Figure 16: Forecasting Rice availability in Burkina Faso Source: DGESS/MARAH

might be challenges in meeting the growing demand for rice or maintaining the same level of rice supply in the country, raising concerns about food security, especially if the decline is not adequately offset by other sources of food or imports. This further indicates a potential gap between the demand for rice and the actual supply, which may lead to higher prices and reduced access to rice for consumers. It is however noteworthy that the forecast is based on certain assumptions and might be subject to changes based on actual developments and interventions.

Rice Demand

The rice demand in Burkina Faso indicates a noticeable upward trend compared to the demand in 2021. The demand for rice is projected to reach 748,141 MT in 2023, compared to 605,619 MT in 2021. This signifies a substantial increase in demand of approximately 23.53%, with a 95% confidence interval. The significant increase in rice demand suggests a rise in food consumption, which could be attributed to population growth, changing dietary habits, and urbanization. This poses a challenge for ensuring food security, as it requires sufficient production or imports to bridge the gap. There is need to prioritize agricultural planning to address the increasing demand for rice and avoid potential food shortages. The surge in rice demand may impact the country's trade balance, necessitating strategic decisions regarding import and export policies.

Rice Surplus

The forecast for the gross rice surplus in Burkina Faso was done. A surplus is defined as a positive balance, while a deficit indicates a negative balance. Unfortunately, over the 2014-2021 period, the country experienced gross deficits in rice, with a significant one in 2019 attributed to the security crisis during the 2018-2019 season as a result, the forecasts for this balance sheet item indicate a continuing downward trend, with the deficit expected to decrease from -322,141 MT in 2021 to -482,334 MT in 2023. This represents an anticipated decline of approximately 49.73%, with a 95% confidence interval ranging between -662,692 MT and -301,976 MT.

A persisting deficit in the rice surplus raises concerns about food security, as it suggests that the country is not producing enough rice to meet the demand, leading to potential food shortages. It further implies that Burkina Faso heavily relies on rice imports to bridge the gap between demand and domestic production, which may strain the country's trade balance and foreign exchange reserves.



Figure 17. Forecast of net rice surplus in Burkina Faso Source: DGESS/MARAH
Trade Balance

A positive trade balance indicates a surplus when the value of exports exceeds that of imports, whereas a negative trade balance signifies a deficit when imports exceed exports. Despite the forecast pointing to a growth in the trade balance by 2023, there was a negative trade balance for the period 2018-2021. This indicates a strong dependence on the outside world for that specific period, relying heavily on imports and aid.

The forecast analysis indicates a variation in the trade balance of 10.66% compared to the 2021 figures. With 95% confidence, it is certain that the trade balance forecast will be between 426,888 MT and 600,921 MT.

One way to enhance a positive trade balance is by promotion and diversification of exports to reduce trade deficits and boost foreign exchange earnings and/or encouraging domestic production of goods that are currently heavily imported and support local industries.

Net Rice Surplus

The net surplus represents the quantity of rice that is available for consumption after deducting all utilization and losses from the total production or availability. It is a critical indicator that helps assess the self-sufficiency or deficit of a country in a specific food commodity. The forecast of the net rice surplus in Burkina Faso is presented in Figure 18. This analysis extends from the forecast analysis of the gross surplus. The forecast indicates a positive evolution of the net surplus variable. While it is lower and decreasing compared to 2021, it is important to note that the forecasted evolution remains in surplus by 2023, with variations reaching 33.76% less than the surplus observed in 2021. the positive forecasted net rice surplus in Burkina Faso, while showing a decrease compared to 2021, remains an encouraging sign for food security and self-sufficiency. Addressing agricultural productivity challenges and implementing effective policies will be crucial to maintaining or improving future surpluses and ensuring a stable and reliable rice supply for the population.

Per capita consumption of Rice

Rice consumption per capita reached 34.7 kg in 2017 in Burkina Faso, according to Faostat. This is 2.69% more than in the previous year. Historically, rice consumption per capita in Burkina Faso reached an all-time high of 34.7 kg in 2017 and an all-time low of 3.58 kg in 1974 (Figure 19). By the year 2023, there is a projected rise in per capita availability of rice by 4.68%, which equates to 36 kg per capita. The increase in per capita availability of rice signifies improved food security for the population



Figure 18: Rice consumption per capita in Burkina Faso (1961-2017) Source: FAOSTAT, Helgi Calculation



Figure 19: The roles of the permanent system facilities Source: Authors 'own compilation

which may also positively impact the livelihoods of smallholder farmers and rice-producing communities, as it suggests increased demand and potential income opportunities.

3.5 Conclusions and recommendation

The analysis and forecasts of Burkina Faso's rice sector present both challenges and opportunities. Some of the challenges include Value chain highly fragmented with limited access to working capital financing, Market share of local rice stunted due to availability of less expensive imported rice from Taiwan; Lack of storage facilities, bad roads, and poor electricity impede productivity. The opportunity is Bagre Growth pole project is a priority investment zone with irrigation potential.

While the country has achieved a 53% selfsufficiency rate in rice production, heavy reliance on imports exposes it to global market price fluctuations and shocks. The rising costs of imports divert resources from essential development projects, making it crucial to enhance self-sufficiency, increase surplus for export and reduce import dependency. The increase in rice demand by 2023 calls for strategic planning and investment in domestic production to meet the growing population's needs. Addressing yield limitations and promoting good agricultural practices are essential to achieving the ambitious production targets set by NRDS. The positive forecast of rice availability per capita is promising for food security and consumption, but careful monitoring and adaptability are needed to navigate potential challenges. A comprehensive approach is required, including policies to promote domestic production, diversify exports, and boost agricultural productivity, ensuring food security and sustainable agricultural development in Burkina Faso.

Some recommendations

 Increase Productivity: Efforts should focus on promoting better access to quality inputs and encouraging the adoption of Good Agricultural Practices (GAP) among rice producers. Again, invest in irrigation facilities to reduce dependence on rain-fed farmland. This will enhance efficiency and yield potential, contributing to the realization of the ambitious production goals set by NRDS.

- Processing: Investment in scalable milling, scaling, threshing technologies in processing is key. Further, explore solar energy driven processing to drive down production cost.
- 3. **Foster Self-reliance**: Burkina Faso should prioritize increasing rice productivity and reducing dependency on costly imports. This can be achieved through the development of effective policies and strategies that support and promote improvements in local rice production, such as improved agricultural practices, technology adoption, and research-driven approaches.
- Diversify Exports: To enhance the trade balance, the country should promote and diversify exports to reduce trade deficits and boost foreign exchange earnings. Supporting local industries and encouraging domestic production of goods that are heavily imported can contribute to achieving a positive trade balance.
- 5. **Monitor and Adapt:** Given the uncertainties related to external global shocks like the COVID-19 pandemic or geopolitical conflicts, monitoring and adaptability are crucial in navigating the dynamics of rice demand and supply effectively. Policymakers should be prepared to adjust strategies as needed to respond to changing circumstances.
- 6. **Invest in Agricultural Research**: To unlock further yield enhancements, identify and address potential limitations or constraints in achieving higher productivity. Investing in agricultural research and extension services can provide innovative solutions to improve rice production practices and yield potential.
- Enhance Sub-Regional Trade: Efforts should be made to strengthen the sub-regional rice market by promoting regional trade and cooperation among ECOWAS countries. Encouraging rice imports from neighboring countries can enhance regional food security and reduce dependency on external sources.

4 | Description and Analysis of the Rice Value Chain

This chapter discusses the different nodes, service providers and the role of the state along the rice value chain. The selected rice value chain nodes consist of rice consumers, marketing actors, processors, and producers. The main challenges faced along the value chain and remedies are discussed to promote the development and functioning of the rice value chain in Burkina Faso.

4.1 Analysis of selected nodes of the rice value chain

The Rice value chain in Burkina Faso has several actors as shown in Figure 20. They include input suppliers, producers, processors, transporters, state among others.

4.1.1 Rice consumption in Burkina Faso

Status of rice consumption

Rice consumption is part of the dietary habits of the people of Burkina Faso in general and those living in the big cities in particular. Indeed, of all the cereals consumed in Burkina Faso, rice accounted for 12.8% of the calories after maize (30.5%), sorghum (26.6%) and millet (23.6%) (MAAH, Bilans alimentaires du Burkina Faso 2013-2019).

Average per capita rice consumption in Burkina Faso is estimated at 28.83 kg/year, of which 12.09 kg/year is produced domestically in Burkina (MAAH, 2017). Rice consumption increased at a rate of 9.31% over the period 2005-2019 (FAOSTAT, 2022). This trend is likely to increase in the coming years because of the population growth in the cities due to rural urban migration and forced displacement. In recent years, an upsurge in violent conflict in Burkina Faso has displaced approximately 1,579,976 people, a trend that has intensified internal migration to urban areas.

Consumer preferences

Rice is consumed across all socio-professional classes in Burkina Faso. However, all these

classes do not consume the same kind of rice. Well up Burkinabè prefer better quality rice, which they describe by physical criteria such as 'fragrance rice', or by brand such as 'Uncle Sam rice' or 'basmati rice'. Low income and large households go for low-quality rice, most often called 'mwi m'ba boanga nīn zak ramba' in Mooré or 'malo den ka ca' in Dioula. These names denote the low costs that these types of rice are known for and can feed a large family due to its high starch content and low moisture content.

A negligible percentage of urban population consumes locally/ domestically produced rice which they consider organic and naturally produced.

Challenges with Burkina Rice: Domestically produced rice from Burkina Faso is not preferred by many consumers since they consider it difficult to prepare due to the high moisture content. Others find the Burkina rice lacking in organoleptic stability (especially taste). In addition, impurities (stones, black kernels, whitebellied kernels and paddy) have been found in some stocks even though considerable efforts have been made by the actors to reduce the level of impurities. And finally, consumers are concerned that Burkina rice does not 'swell', unlike imported rice, which is popular with large and low-income households. Again, the consumers are put off by the frequent lack of supply of Burkina rice due to paddy supply constraints.

Opportunities for Burkina Rice: Although Burkina rice does not often meet consumer expectations and is of lower quality than imported rice, there are cases where locally sourced rice varieties have distinctive qualities that consumers appreciate. This is the case for TS2 rice and Ory luxe rice. The ordinary Burkinabè urban consumer has a strong preference for these two varieties. There are also some processing plants that successfully market rice from Burkina Faso of very high quality, although the supplies are insufficient.

If well packaged, homogeneous, free of impurities and available, consumers are more likely to opt for locally produced Burkina rice than the imported one. For Ouédraogo et al (2021), Burkina rice can compete with imported rice in urban markets if price, quality, and availability are considered.

4.1.2 Rice production in Burkina Faso

Rice production in Burkina Faso is in the hands of a group of producers noted for their production system and the degree of their control over water. The number of producers who engaged in rice farming in the 2018/2019 season was estimated at 386,864, (EPA, 2018). The size of the rice-growing acreage ranged from 144,261 hectares to 177,256 hectares during the 2013/14 to 2018/19 seasons. The country is endowed with a high potential for 233,500 ha land for irrigation and 500,000 ha of easily reclaimed lowlands for rice production, of which about one-fifth is in use (*SNDR, 2021-2030*).

There are different types of rice systems in Burkina Faso:

- Strictly rainfed or upland rice,
- Lowland rice (developed and undeveloped) and
- Irrigated lowland rice.

In purely rainfed or upland rice cultivation, performance depends on the distribution and quantity of rainfall, thus yield fluctuate with the rainfall. In lowland rice production yields are still low, due to the constraints, often the secondary nature of this production and the new hydro-climatic risks (weeds, insects, floods, erosion, and droughts) (*Serpentié et al, 2019*). On the irrigated plains where we have the highest yields, the existing irrigation systems are pump and gravity-fed. The main irrigated areas are: Bagré, Sourou, Vallée du Kou, Banzon, Karfiguela, Douna. The gravity – fed system, given the total control of water, is a dual annual season and the best channel for rice production.

The average yields recorded by ecozone during 2018/2019 were: (i) 5,033 kg/ha in irrigated rice, 2,611 kg/ha in reclaimed lowland rice and 1,515 kg/ha in non-improved (DGESS/MAAH, 2018).

During the 2013-2016 period, the contribution to total production was as follows: the reclaimed plains and lowlands 57%, un-reclaimed lowlands 39% and uplands rice 4% (DGESS/MAAH, 2018). This high rate of contribution can be explained on the one hand by the substantial increase in yields in the irrigated plains and on the other hand by the partial control of water in the reclaimed lowlands.

Challenges in Rice production: Although high yielding; Irrigated rice farming faces a series of limiting factors that hamper its performance. Abiotic factors (late harvesting, poor threshing, etc.) and biotic factors (attacks by microorganisms, pests, etc.) lead to postharvest losses of between 19 and 37% of the yield. Although the cost of fertilizer is subsidized in Burkina Faso, the prices are still very high pushing up the cost of production. Producers continue to incur high fertilizer costs. This pushes up the price of paddy, which is detrimental to the processors. Failure to adhere to the cropping cycle affects the quality of the paddy, which in turn impacts on the performance of the processing units.

4.1.3 Rice processing in Burkina Faso

Burkina Faso has two main types of rice processing:

- 1) Steaming
- 2) Milling.

Steaming is mainly carried out by women. The women are members of a cooperative affiliated to the National Union of Rice Steamers (UNERIZ) and work on their own at home. Some cooperatives run their own steaming stations, set up with the support of partners (technical and financial). Once the rice has been dried and husked, the dried rice product is sold in three types of market: 1) institutions 2) the wholesale and 3) the semi-wholesale/retail market and the non-packaged market (often sold by the plate, the tomato can or the yoroba dish, depending on the region). In this regard, it is worth noting that the use of local units of measurement (tomato cans, yoroba dishes, depending on the locality) makes it difficult to establish a quantity of measure.

Milling is done by semi-industrial and industrial

units that are concentrated around the major cities (Bobo-Dioulasso, Ouagadougou) and large production sites (Banzon, Sourou, Bagré). These processing units have an annual processing capacity of more than 30,000 MT/year of milled rice (NRDS 2021-2030). The situation has improved because of the heavy investment in the processing chain in recent years. There are about 120 semi-industrial and industrial units that process 49% of paddy production (PDA/GIZ, 2022). These companies vary in size in terms of equipment, processing capacity and turnover. The milled paddy/ the 'white rice' product obtained, is sold on three types of market: 1) the institutions 2) wholesale and 3) the semiwholesale/retail market and the unpackaged market (often sold by the plate, etc.).

The white rice is found in the local and urban market (Bobo-Dioulasso's central market). It is sold using the plate, by women traders and individual steaming workers who shell part of the paddy purchased from producers' cooperatives at small scale units. The capacity of these smallscale units is estimated at 216,000 MT per year *(EU, UNPRB, VECO West Africa, 2014).* They hull "everything" for these traders, who have no consideration for the quality of paddy rice; even though the rice enhancement network in Burkina struggles to supply the market with quality rice that is free of impurities, has a minimum level of broken rice, a low moisture content and is homogeneous.

The small-scale processors (93.6% of the total number of processors; PDA/GIZ, 2022), should not be sidelined in the rice import substitution policy, contrary to the intervention approach adopted by several stakeholders in the sector. They need training to improve the quality of rice in the markets.

<u>Challenges in processing rice:</u> Semi-industrial and industrial processing and steaming are the main alternatives for rice value addition in Burkina Faso. However, the semi-industrial and industrial processing units and the drying canters encounter several constraints. They have liqudity issues and the processors are not able to advance money to producers. Again, the processors are unable to buy paddy directly for cash at the right time or by pre-financing producers, thus it is difficult to have high volumes to realize economies of scale. Most processing units have low-capacity uptake while milling and steaming costs are high. This is due to the cost of purchasing paddy and the cost of financing. In addition, milling efficiency is relatively low, averaging between 60% and 62% against an expected efficiency rate of 70%. The low technical efficiency of the mills is due to the quality of the paddy and poor technology. Some processing lines are not complete (lack of color sorters), which affects the quality negatively.

Like the Asian countries, the performance of processing units is almost as important for food security as crop yields (*Reardon et al., 2014*). This efficiency requires technological transformation. There are two areas of intervention that may be necessary to facilitate technological transformation: the upgrading of existing industries and the creation of new, more modern units. The government should provide subsidies for modernization of existing factories. The state can also encourage domestic investors to participate in Burkina's rice VC by creating incentives for entry.

4.1.4 Marketing channels for rice in Burkina Faso

In Burkina Faso, different types of rice are available for domestic markets (local shops, large markets, high-end markets) and regional export markets. There are four main categories of rice marketing channels:

- 1) Imported rice sold in local shops,
- Locally produced rice, which is most often sold in shops specializing in this type of cereals,
- Rice donated as international aid, which can be found in government run shops under the parastatal Société nationale de gestion du stock de sécurité alimentairé (SONAGESS), which also sells local rice and,
- 4) Paddy rice for export markets.

Imported Rice: Several active importers (approximately 40) import rice into Burkina Faso. The major suppliers of rice to the importers are large multinational trading companies such as Cargill, Dreyfus, etc. (Tondel et al, 2020). About ten of them are large importers. However, the three largest importers account for 70% of all rice imports in Burkina Faso (Tondel et al, 2020). Burkina Faso's rice import market is largely oligopolistic, which results in a non-competitive market. The oligopolistic nature of the imported rice value chain has led to middlemen passing over international market price hikes onto domestic market consumers (Badolo, 2012).

Importers have large warehouses from which they distribute rice across the whole country. They rely on a network of local traders (wholesalers, semi-wholesalers, retailers), over whom they have tight control. Importers supply rice to wholesalers in Ouagadougou and Bobo-Dioulasso. The wholesalers then supply the semi-wholesalers operating in smaller or other towns. Each semi-wholesaler has contractual arrangements with a wholesaler through which he gets rice supplies either on credit or in cash. Retailers source their supplies from semiwholesalers in varying quantities of between one and ten MT (Badolo, 2012). The retailers are more concentrated in urban centers and small towns.

The imported rice distribution channel takes the rice to the consumer's doorstep, thus sparing the consumer long trips to buy rice. However, this channel has faced disruptions due to shortcomings in the international market. There is concern from marketers of imported rice that Asian countries are stretching their production potential while global demand for rice continues to increase. Thus, a few international operators such as Olam are raising their margins by in sourcing the supply chain through massive investments on the continent (*Tondel et al, 2020*). This would be a major boost to locally produced rice.

Locally produced rice: Distribution of locally produced rice (Burkina rice) is carried out by a network of traders, most of whom are members of the Association Nationale des Commerçants de Riz du Burkina (ANACOR-B). Data from ANACOR-B shows that there are about 295 traders in this network. The traders' outlets in Ouagadougou and Bobo-Dioulasso can easily be located using a digital application.

Sale outlets for Burkina rice, unlike for imported rice, are located far away from the consumer. It is also rare to find Burkina rice in local shops selling in retail or small quantities. Burkina rice traders have a low financial capacity that hinders them from ordering large quantities.

The greatest difficulty facing Burkina rice is the inability to bring the rice closer to the consumer and to ensure there are supplies throughout the year. Processing units need to strengthen their distribution network and increase their production. More particularly, they must incorporate traders selling imported rice into their distribution network.

Donated Rice: The SONAGESS is the third channel through which rice is distributed in Burkina Faso. Rice donated as part of international aid as well as a large proportion of Burkina's rice is sold in SONAGESS' specialized shops, usually at a slightly lower price than the prevailing market price. The SONAGESS is a major player in the rice sector in Burkina Faso. The SONAGESS' mandate includes regulating domestic cereal markets and supplying to public institutions (public schools, prisons, hospitals, armed forces). Although the SONAGESS is a major outlet for rice production and plays a critical role in Burkina Faso's food security, the parastatal still faces challenges related to quality of Burkina rice, especially given the efforts stakeholders have made to ensure quality rice.

<u>Rice for export</u>: Exports of paddy rice from Burkina Faso to countries in the sub-region are increasingly common. According to Tondel et al (2020), there are several major export marketing channels for rice in Burkina Faso. The first marketing line is between western Burkina Faso and south-eastern/eastern Mali and the second between southern Burkina Faso and northern Ghana.

The first distribution channel is that of rice produced in the Hauts-Bassins and Cascades regions and in the Boucle du Mouhoun region. Rice produced in and around the Kou and Bazon valleys, in Douna and Karfiguela, is sold in the major markets in the neighboring areas of Sikasso region, such as Koury (a rural commune in the Yorosso circle) and Sikasso (a secondary consumption Centre). This trade has a negative impact on the processing units located in the region as it deprives them of adequate volumes of rice. During the 2012-2019 period, annual informal trade volumes averaged 2,115 MT (between a low of 1,405 MT in 2014 and a high of 3,534 MT in 2013) (Tondel et al., 2020). Rice produced in the Sourou Valley in the Boucle de Mouhon is sold in the border markets in the Segou region of Mali. Exports from this region to Mali can be attributed to the difficulties of access to the markets in Ouagadougou and Bobo-Dioulasso due to the poor state of the roads, especially during the rainy season.

Rice grown in the Bagré rice growing plains is usually sold via the second export marketing channel. Bagré has increasingly seen the influx of Ghanaian traders who buy paddy rice, some of which is milled or steamed for export. This influx is due to the increased demand for paddy in northern Ghana because of the growth of the local milling industry since 2008 (*Tondel et al., 2020*). Although Burkina Faso allows rice exports, the country has strict controls on exports (Special Export Authorization). These controls have made it increasingly difficult for Ghanaian traders to source paddy rice from local collectors.

In addition, the expansion of rice production in Ghana has increased demand for rice seeds. Burkina Faso produces and exports rice seeds to Ghana through the NAFASO company. Demand for Burkina seeds in Ghana is due to lack of certified rice seed system in Ghana. (Tondel et al., 2020).

Export flows of paddy rice and rice seed from Burkina to Mali and Ghana should inform the implementation of the rice import substitution policy.

Major imported rice distribution outlets are gradually shifting to direct procurement from local rice millers. The current integration (38 entities) between the leading rice importers and local rice millers is in and by itself an important transformation.

4.1.5 Key rice value chain associations in Burkina Faso

The main umbrella organizations in the rice VC in Burkina are :

- L'Union Nationale des Producteurs de Riz du Burkina Faso (UNPR-B) ;
- L'Union Nationale des Étuveuses de Riz du Burkina Faso (UNERI) ;
- L'Union Nationale des Transformateurs de Riz du Burkina Faso (UNTR-B) ;
- L'Association Nationale des commerçants de Riz du Burkina Faso (ANACOR-BF).

All the main organizations of the rice VC are under an umbrella organization. These umbrella organizations are all united under the *Comité Interprofessionnel du Riz du Burkina* (CIR-B), founded in 2001 and restructured in 2008. The members of the association are 23,000 rice growers, 7,000 steamers grouped into cooperatives, 9,500 rice collectors, processors and distributors grouped into 120 individual companies and economic interest groups.

The different umbrella organizations of the rice VC in Burkina Faso have their own interests, which are often divergent. Each umbrella organization defends the interests of its own members. Each umbrella organization seeking to maximize its members' profits at the expense of collective competitiveness.

4.1.6 Support and regulatory services for the rice value chain

Support and regulatory services for the rice VC in Burkina is through indirect players: 1) providers of support services to the rice VC and 2) the regulator (the state).

Support services to the Burkina rice Value Chain

Support service providers assist in transporting products, supervising, advising, and funding agricultural ventures. They also play an important role in production, processing, and marketing (sourcing for markets and funding commercial activities). These are input and equipment suppliers, credit institutions, transporters, research and extension institutions, technical and financial partners. There are two categories of support service providers:

- permanent facilities
- projects and programs/ non-permanent

The permanent system facilities are made up of both public and private facilities. The roles of the permanent system and the non-permanent system facilities are shown in Figure 20 and Table 2.

Challenges along the service providers

along the rice VC: Based on interviews with stakeholders, the results show a gap in support services for access to credit or working capital and investment support, which represent bottlenecks in the operation of the rice Value Chain. The lack of /or inadequacy of credit



Figure 20: Map of the white rice Value Chain (VC) in Burkina Faso

Source: Authors 'own compilation

Table 2: The roles of the non-permanent system facilities

		Support (✓) in									
Institution	policy	devel- opment	process- ing	market- ing	organi- zation	process- ing	Pro- ducer organi- zation	Storage	Infra- struc- ture	Produc- tion	Vaalori- zation
FAO	~	~	~	~							
AGRA	~	~	~	~							
GIZ (PDA, CARI, PROCIV	~		~	~	~						~
PCA/BF-CH	~	~	~	~	~						~
BAGREPOLE	~	~	~	~	~						~
PAPFA				~		~	✓	~	~		
VALPAPE				~		~	✓	~	~		
RIKOLTO				~		~	✓	~	~		
PIGO				~		~	✓	~	\checkmark		
OXFAMS			~				~			~	

Source: Authors' own compilation

support means that most actors (producers, processors, traders) lack the cash flow to guarantee the proper running of their activity and to invest in efficient means of production. In particular, the cash flow constraint poses a double problem for processing units. They have difficulty paying producers when paddy is available and collecting large volumes of paddy that would give them access to larger and more markets in urban areas. Inadequate investment support means that direct rice VC actors have very few options to improve their means of production, such as warehouses, operating equipment, giving little prospect of improving the quality of rice and developing the value chain. Moreover, the interventions of the different indirect actors are not well coordinated and harmonized.

The role of State in the Burkina Rice Value Chain

The Burkinabe government regulates/operates the Burkina rice Value Chain at several levels:

Extension and advisory role: The government plays a role in agricultural advisory and extension services. Agricultural extension and advisory services are the main functions of the Directorate General of Crop Production (DGPV) through its Directorate of Extension and Research and Development (DVRD). The DVRD as a technical division responsible for the coordination, harmonization of actions, capacity building and monitoring/supervision of extension and advisory activities for farmers. However, government extension has had a weak role in farmers' technology transfer due to the lack of human resources at the national level. The ratio is about one agent for every 14,000 producers/ farmers. This leaves a heavy workload, coupled with the inability to reach all producers. It is the private extension services provided by NGOs and projects/programs that have stepped in to fill this gap. Unfortunately, there is a lack of harmonization between agricultural extension and advisory services in Burkina Faso.

Subsidies and the sale of inputs: The

government is active in the direct sale of inputs. This is through provision of subsidies for fertilizer and mechanization. The direct sale of inputs by the government plays a very minor role, as the share of inputs purchased through government outlets is small. The private sector is the main supplier of input to farmers.

<u>Research & Development</u>: The government plays an important role in the research and development of improved paddy seeds. As a result of its interventions, several improved seeds that meet consumer expectations have been developed in Burkina Faso.

Infrastructure development: The government contributes to infrastructure development. The large, reclaimed plains (Bagré, Sourou, Vallée du Kou, Samendeni) were created with the cooperation of the government and its partners. Trade relations within the rice VC are fraught with many uncertainties caused by inadequate or poor-quality infrastructure (storage warehouses, roads, telecommunications, etc.). Inadequate and/or poor-quality roads minimize the scope of the supply chain.

Purchase Rice through SONAGESS: The government buys rice and paddy from farmers and cooperatives through SONAGESS. Buying rice from producers and cooperatives creates a conflict of interest and an imbalance of power between producers and processors. There is an overlap of functions within the Burkina rice VC. For example, producers want to replace processors and traders want to replace processors, and vice versa. Rice sold by SONAGESS is sometimes of poor quality and undermines the reputation of Burkina rice. Also, intervention by SONAGESS in pricing creates market distortions. Finally, government intervention in domestic markets can undermine the incentives of private value chain actors to invest in technologies, organizational practices and coordination mechanisms that improve productivity and quality (Tondel et al., 2020).

In contrast, the government has little direct role in the processing and marketing links, with a few exceptions that are specific to facilitating access to credit that remain marginal. The government's role remains essentially focused on the farm. Yet the performance of downstream enterprises is almost as important to food security in Burkina Faso as agricultural yields. Besides, there exists a weak institutional framework marked by the lack of effective control mechanisms and system of sanctions that encourage opportunistic behavior.

4.2 Mapping the Rice Value Chain in Burkina Faso

Burkina's rice VC was mapped to provide clear information on the flow of rice from production to consumption and on the roles and functions of all the stakeholders along the value chains. In mapping the value chain, three distinct VC maps will be discussed mainly:

- Local white rice
- Local steamed rice
- White and steamed rice (combined)

4.2.1 Mapping the local white rice value chain

The white rice VC in Burkina is driven by different actors who play different roles as mentioned:

- Input suppliers, which are INERA, seed producers, AGRODIA, suppliers of phytosanitary products, regional directorates in charge of agriculture, producer groups and processors. Some processors provide inputs to producers.
- Individual producers, producer groups, collecting traders, traders, and processing units.
- Service providers agricultural and nonagricultural service providers.

Urban and rural households, restaurants, institutions, and exporters are the main markets for white rice. Overall, there are four marketing channels for white rice. To begin with, the processing units serve the urban households' and the restaurant directly, as well as the institutional markets. The processing units also rely on a network of traders (wholesalers, retailers) to sell their produce. Many traders supply the rural household markets and the export market directly. Processing units provide services and hull rice for these traders. Paddy processing by the units is not driven by export markets, but rather by urban and institutional markets. In contrast, the activity of some traders/ collectors is motivated by the export market.

The processing units buy mainly from producer groups. On the other hand, collectors and traders purchase from both individual producers & producer groups. The interests of traders/ collectors and processing units can be divergent depending on the issues at stake. Depending on the opportunities on the export market, traders may raise prices to secure all available paddy rice.

Informal modes of marketing and supply dominate the white rice VC, as illustrated by the broken arrows in Figure 20. Individual producers and producer organizations supply paddy to buyers (processing units and traders) based on independent commercial relationships.

Some semi-industrial or industrial units, especially those located on the reclaimed plains, provide input to producers. This is because the qualitý of the paddy, defined in terms of cleanlinesś, moisture content, varietal puritý and homogeneitý, strongly influences the qualitý of the white rice available in the market. For these reasons, these units indirectly control paddy production through contract farming. Thus, the farmers supply paddy as per the quality requirement of the processing unit.

Challenges along the white rice VC: There are several constraints in the relationship between the direct actors that drive the white rice VC. Paddy producers expect to be paid in cash on delivery, whereas in fact the processing units are not paid for in cash by the traders. Producers do not want to wait for payments and some of them end up selling their rice to traders/collectors. Other traders want the rice mills to sell rice in bulk to interfere with branding process. They no longer want to see information about the rice mill on the packaging, but rather about the trader.

4.2.2 Mapping the local steamed rice value chain

The actors in the steamed rice VC are also divided into three categories namely:

- Input suppliers direct actors (individual producers, producer groups),
- Dryers Individual dryers, steaming canters, dryers' groups, and traders.
- Service providers small-scale mills, transporters, operational providers

The main markets consist of rural and urban consumers, the exports the institutions, and the household market. Dried rice is sold in bulk on the rural and export markets by individual steamers and traders. Packaged rice, on the other hand, is marketed to urban consumers by dryer groups and traders. The dry kiln centers supply rice exclusively to institutional and restaurant markets.

The small-scale mills in rural areas provide services and hull "all-purpose" rice for individual steamers who do not have any requirements on the quality of the paddy rice, or who do not have the means to improve the qualitý of the paddy rice and enhance the competitiveness of the value chain.

The individual steamers purchase rice directly from the individual producers. This is made possible by physical location and social ties. They also buy from producer groups. Groups of steamers and steaming centers buy from producer groups. Like the white rice, informal modes of marketing and supply dominate the steamed rice VC, as illustrated by the broken arrows in Figure 21. The interests of the direct actors may converge and sometimes diverge depending on the issue at stake.

Challenges within the steamed rice VC:

Steamed rice marketed by individual steamers and sold in bulk is often of poor quality, which can damage the reputation of steamed rice and undermine the efforts of steaming centers to continuously improve quality. Producers and steamers would like to improve their commercial relations in terms of product quality and price but may also differ on the possible solutions. Producers prefer payment in cash while the steamers are unable to pay in cash.

4.2..3Mapping the entire rice (White & steamed) value chain.

The entire rice VC map reveals that a significant flow of Burkina rice and paddy is channeled through SONAGESS (Figure 22). Steamers are key in the processing of paddy. A substantial amount of the paddy produced is consumed by the farmers themselves. However, it should also be noted that these stocks of domestic paddy for self-consumption usually find their way back to the local markets; sold at retail and collected by traders/collectors.



Figure 21: Map of steamed rice VC in Burkina Faso

Source: Authors 'own compilation



Figure 22: Map of the overall rice VC in Burkina Faso

Source: Authors 'own compilation

The entire rice value chain in Burkina Faso suffers from weak integration. Generally, the paddy producers are independent. The price and quantity of paddy dictate the supply of white and steamed rice released to the market. Buyers align themselves with product specifications and prices set by the paddy producers. However, some processing units located on the large rice-growing plains operate on a relationbased governance approach. There is an interdependence between these units and the producers which is reflected in the provision of agricultural inputs and advisory services. The unitmaintains close and regular contact with its producers, especially through the supply of inputs, which are upheld based on reputation, local presence, and trust. The processing unitenforces its own quality and quantity standards.

Challenges exist in the various business interactions involving the main actors in Burkina's rice VC. Traders who are members of ANACOR- BF condemn the fact that some processors are setting themselves up as traders and running rice sale outlets. The processors monitor the trader's distribution channels and later take over their customers. The processors blame the traders for not respecting their contractual commitments (non-respect of payment deadlines or non-payment). According to some direct actors in the rice VC, the institutional markets are not equitably distributed among the different umbrella organizations. They also dislike the delays in payment by SONAGESS.

4.3 Summary of challenges and constraints along the rice value chain

The rice value chain analysis conducted earlier revealed the following challenges and constraints that need to be addressed for a more effective import substitution policy (Table 3).

Consequences	Immediate Causes	Root causes
Unavailability of paddy	 Low yields Small amount of land under cultivation Weak links between VC actors Strong competition for paddy Interference from opportunistic traders 	 Flooding of the lowlands Poor rainfall patterns Failure to respect technical guidelines. Limited capacity to access credit Lack of a marketing platform Poor coordination & governance rice VC
Inconsistency in the quality of husked rice	 Varietal mix Lack of incentives to produce quality rice. Difficulty to apply specifications at the production level. Insufficient storage facilities Difficulty in accessing mechanization. Lack of processing equipment 	 Problem of varietal identification Unavailability of paddy High number of producers on small pieces of land. Limited access to credit
Weakness in the distribution network	Disinterest of traders in imported riceWeak interaction among VC actors	 Limited access to credit Lack of trust between stakeholders Relative weaknesses of commercial margins
Weak links between the different sectors of the value chain	 Conflict of interest stakeholders in rice VC Weaknesses of umbrella organizations Lack of leadership of the Interprofessional Rice Committee of Burkina Faso (CIR-B) Disequilibrium between competitiveness and coordination in the VC 	 Lack of trust State intervention that modifies power relations Lack of a mechanism to regulate interactions in the rice VC
Low price competitiveness of rice produced in Burkina Faso	Increase in the price of paddy.High processing costLow yields	 Lack of credit Poor quality of paddy Difficulty in accessing quality inputs. High cost of inputs
Difficulties in accessing the public market	Poor targeting of marketCorruption along the entire decision- making process	Strong marketing by producers

Table 3: Challenges and constraints in the rice value chain

4.4 Conclusion and Recommendations

- Burkina Faso is endowed with over 233,500
 ha land for irrigation and 500,000 ha of easily
 reclaimed lowlands for rice production, of
 which about one-fifth is in use.
- If well packaged, homogeneous, free of impurities and available, consumers are more likely to opt for locally produced Burkina rice than the imported one. Burkina rice is competitive in the market.
- Milling efficiency is relatively low, averaging between 60% and 62% against an expected efficiency rate of 70%. The low technical efficiency of the mills is due to the quality of the paddy and poor technology. Some processing lines are not complete (lack

of color sorters), which affects the quality negatively. To improve milling efficiency, a technological transformation is key through 1) the upgrading of existing industries and 2) the creation of new, more modern units. The government should provide subsidies for modernization of existing factories. The state can also encourage domestic investors to participate in Burkina's rice VC by creating incentives for entry.

 The expansion of rice production in Ghana has increased demand for rice seeds.
 Burkina Faso produces and exports rice seeds to Ghana through the NAFASO company. Demand for Burkina seeds in Ghana is due to lack of certified rice seed system in Ghana.

Recommendation

- Only 14% of the acreage for irrigation is in use in Burkina Faso. The government should therefore increase the acreage under irrigation through investments to support the intensification of paddy production. However, the technological kit for the development of irrigated rice requires significant investments that may be difficult to mobilize with the national budget of Burkina Faso alone. In the light of the policy of rice import substitution, the government should explore other alternatives based on public-private partnerships in addition to the call on the bilateral and/or multilateral partners.
- Burkina Faso should strengthen basic technology of paddy intensification, using improved seeds, chemicals, and irrigation. The government should facilitate access to certified seed through capacity building of the formal seed system. Mechanization should be made accessible to all segments of the farming population, not just to largescale farmers. To achieve this, outsourced farm mechanization services should be developed, enabling farmers to switch from manual to mechanized harvesting. The government should also facilitate access to cheap fertilizers and pesticides through

general subsidies and ensure that they are available in small shops throughout the rural areas. The availability of agricultural advisory and extension services promote Good Agricultural Practices (GAPS).

- This milling efficiency requires technological transformation. There are two areas of intervention that may be necessary to facilitate technological transformation: the upgrading of existing industries and the creation of new, more modern units. The state should promote technology transformation through tax break and removal of import tax from milling machines and apply preferential rates on goods e.g zero rating.
- The small-scale processors (93.6% of the total number of processors; PDA/GIZ, 2022), should not be sidelined in the rice import substitution policy, contrary to the intervention approach adopted by several stakeholders in the sector. They need training to improve the quality of rice in the markets.
- Export flows of paddy rice and rice seed from Burkina to Mali and Ghana should inform the implementation of the rice import substitution policy specifically while considering export of the surplus.

5 Ex Ante Impact Evaluation of Rice Policy Options

This chapter presents the findings of a top-down macro-micro simulation approach that coupled a computable general equilibrium modeling with econometric microsimulation to quantify the exante impact of several policy options:

- Increasing the productivity of irrigated rice (agropoles) in Bagré, Samandeni & Sourou sites)
- Increasing the efficiency of rice processing (transformation),
- Improving marketing efficiency through the reduction of price differentials between producer and consumer prices, and
- Increasing rice import customs tariffs (trade).¹

The ex-ante impacts of these different policies on the country's value added (production), domestic prices, imports, household consumption, and economic growth are compared to form the basis for future policy recommendations and options to be implemented by the Government.

5.1 Methodology²

This method is a variant of the dynamic version of the standard PEP 1-t computable general equilibrium (CGE) model which was developed by Decaluwé et al., (2013), and the microsimulation model proposed by Tiberti et al., (2018). The structure of the model is based on the neoclassical general equilibrium paradigm. Producers maximize their profit under the technological and independent price constraints. Each production sector has an interrelated production structure where output is represented in a four-level process.

The distributional and welfare effects of rice sector expansion and rice product revenue

management options are captured by a microsimulation module combined with a computable general equilibrium model. This procedure is particularly important because the CGE model is not able to consider the changing inequalities within a subgroup of the population. To do so, a top-down macro-micro simulation approach is adopted, integrating the households' micro behaviors. As a result, household behaviors can then be affected by policy options and changes over time.

The database used for the CGE model is a 2018 Social Accounting Matrix (SAM) and is based on the 2013 SAM structure constructed by the Ministry of Agriculture and Water Development (MAAH, 2016). A SAM is a comprehensive framework that represents all flows recorded within the economy each year. In relation to the agricultural SAM, our model is composed of 32 companies including 16 agricultural industries and 35 products including 17 agricultural products. Changes in prices and household consumption expenditures from the Computable General Equilibrium Model (CGE) are used as inputs in the microsimulation model. In other words, the average change in consumption expenditures of the representative CGE model household is used to update household consumption expenditures from the 2018 Continuous Multi-Sector Survey (CMS). To balance the agricultural SAM data and the household survey data, the Social Accounting Matrix for the year 2018 is combined with the 2018 Employment Resource Table (ERT) data.

The baseline scenario describes the evolution of Burkina Faso's economy without any change in the rice sector development policy. In Burkina Faso, the functioning of the economy is influenced by a security crisis since 2016 and is then affected by the COVID-19 pandemic in 2020. IMF forecasts were used to estimate the average annual growth rate of real GDP for the simulation period. It is important to note that the

Details of the top-down macro-micro simulation approach (computable general equilibrium and microsimulation) employed, and the Social Accounting Matrix data used are provided in the annex.

² Refer to Appendix 2 for further details.

IMF GDP forecasts vary from year to year, as they consider security, health (COVID-19), political, and economic aspects, among others, that are not fully captured in a CGE model. Labor supply is assumed to grow at the same rate as the total population of Burkina Faso. We also assume that public current and investment spending will grow at the same rate as GDP, because GDP growth considers the government's commitments to the development outlook (emergency health and security plan). This reference scenario therefore includes the current reforms. The results of the simulation scenarios presented in this report are a variation of the reference scenario.

5.2 Description of scenarios for the rice import substitution policy

Five scenarios were designed and modeled. The first three scenarios represent the introduction of innovations or new practices at each stage of the rice value chain that would improve productivity, while the other two are trade policies that would induce changes in the market situation:

- Scenario 1: Productivity gain in the irrigated rice fields (PPI)
- Scenario 2: Productivity gains in the rice processing (PT)
- Scenario 3: Improvement of the transport sector (AST)
- Scenario 4: Reduction in Burkina rice trade margin (MC)
- Scenario 5: Increase in tariffs and quotas on rice imports (TTIM)

These scenarios are conducted under longrun assumptions characterized by differences in the degree of adjustment of government accounts and in the ease with which drivers shift between sectors. They provide some indication of how certain economic variables respond instantly over a smoother, longer period. The analysis of the results is based on both shortterm economic effects occurring in 2025 and long-term economic effects in 2028. Finally, a constraint on the export of irrigated and husked rice is introduced, i.e., over the period 2025-2028, when rice export is limiting.

Methodological limitations: Despite the relevance of the approach adapted in this study, primarily in terms of studying the rice sector in the overall economic framework of the country rather than in isolation, there are few limitations in the method used. One, a few behavioral parameters (such as elasticities) are not readily available in most cases and analysts must make an informed judgment or take those from other empirical literature. In this study, we used elasticities estimated for Burkina Faso by Cockburn et al., (2016). Therefore, a sensitivity analysis of the elasticities could be a value added to ascertain the robustness of the results. However, it should be noted that CGE models remain the preferred tool for ex-ante analysis of policies with effects on the broader economy.

5.2.1 Scenario 1: Productivity gains in the irrigated rice fields

Interventions to improve rice productivity are tied to past and present initiatives in Burkina Faso within the framework of agricultural sector development policies and strategies, especially through the National Rice Development Strategy and trade integration policies. Under the Economic and Social Development Plan (2016-2020), the government has invested in the construction and improvement of rural roads and electrification, all of which could improve the performance of the rice value chain.

Burkina Faso is a signatory member of the Comprehensive Africa Agriculture Development Program (CAADP) and has committed to improve irrigation to achieve food security. However, Burkina Faso's irrigation potential is currently under-exploited. Irrigation in Burkina Faso is poorly developed, gravity-fed with only 33% of the surface area developed out of the 233,500 hectares that are potentially for irrigation (Kambou, 2019). With the support of development partners, the government of Burkina Faso initiated the structural transformation of the rice sector project through agricultural zones. Within the framework of this project, 50,000 hectares were earmarked for development by 2025 (location include Bagré, Samandeni and Sourou). Through these three agricultural zones, the project will contribute to

the annual production of 800,000 tons of paddy, which translates to 520,000 tons of white rice. This will increase the supply of rice in Burkina Faso. The investment plan for the hydroagricultural schemes for the project is as shown in Table 4 (AGRA, 2021).

According to Diao et al, (2010) only 1% increase in public agricultural spending results in a 0.24 percent annual increase in agricultural productivity. Based on the project investment plan, the increase in public expenditure on irrigation is 31.02% between 2024 and 2025, 33.24% between 2025 and 2026, 32.42% between 2026 and 2027 and 19.40% between 2027 and 2028, and this corresponds to an increase in rice crop productivity of 7.44% in 2025, 7.98% in 2026, 7.78% in 2027 and 4.66% in 2028, respectively as per Table 4. In this study the project's investment plan for the period 2025 to 2028 is used.

5.2.2 Scenario 2: Productivity gains in the rice processing

Scenario 2 considers productivity gains in rice processing; thus, set up three rice processing units of 100,000 tons and 34 processing units of 15,000 tons per year each respectively. The aim is to process all the paddy rice produced in the agricultural zones on an area of 50,000 ha. The units will have a milling yield of 65% against 62% for the current units. To achieve this, the following financing plan is proposed as shown in Figure 23 (AGRA, 2021).

Within the framework of the national strategy for the development of rice production from 2008 to 2015 and from 2016 to 2018, the government of Burkina Faso invested approximately 39,220 million FCFA in the development of rice production through construction of processing units. On this basis, there is an increase of 7.86%

Year	Investment FCFA (Million)	Increased Productivity (%)	Increase in public expenditure on irrigation
2024			31.02
2025	40,556	7.44	33.25
2026	56,950	7.98	32.42
2027	73,976	7.78	19.40
2028	58,630	4.66	
Grand Total	230,112	27.86	

Table 4: Increase (%) in rice productivity given cash investment over the years.





Source: Author based on AGRA, 2021 report

in investment in processing between 2024 and 2025, 13.30% between 2025 and 2026, 12.09% between 2026 and 2027, 9.50% between 2027 and 2028 and 1.27% between 2028 and 2029.

Indeed, there is no data on the link between investment expenditure in processing and the productivity of rice processing units. For this purpose, a simplified hypothesis is used, that is, adopting a unitary elasticity between investment expenditure and the productivity of rice processing units.

5.2.3 Scenario 3: Improvements in the transport sector

The choice of productivity changes in the three scenarios is linked to the objectives of rice sector improvement, such as the national rice development strategy and the rice component of Burkina Faso's national agricultural mechanization strategy (2016-2025). The comparative rates are however adapted to maintain a certain degree of comparability between the scenarios. The same assumption is used by (McDermott et al., 2005) in a study to identify value addition opportunities in the New Zealand beef value chain.

Smallholders and/or processing units in Burkina Faso incur transport costs to get rice production to the processing units. Referring to the study by Aragie, (2018) on coffee value chain development in Kenya, it is assumed that investments in rural road development would contribute to reducing the delivery time of produce and thus increase the efficiency of the transport sector. Hypothetically, a 10% increase is considered.

5.2.4 Scenario 4: Reduction of the Burkina Faso rice trade margin

The functioning of domestic markets, trade policies, and rice prices are key to the sector's performance. However, large trade margins hamper the competitiveness of agricultural commodities including rice markets in Burkina Faso. Based on other studies on trade margins in Africa (Teravaninthorn & Raballand, 2009; Van Campenhout et al., 2018), a 10% reduction in trade and transport margin is hypothesized for this scenario analysis.

5.2.5 Scenario 5: Increase in rice import tariffs.

According to Gillis, M. (1998), protective tariffs on rice imports provide two types of support to the rice Value Chain in Burkina Faso.

One, the domestic price of imported rice will be higher than the world price. For Burkina Faso, the international price of imported rice is equal to the cost of rice delivered to the port of entry, which is the Cost, Insurance and Freight (CIF) price. Without a customs tariff, the price of imported rice on the domestic market would be at the same level as the worldwide price. Applying a tariff raises the price of imported rice in Burkina Faso beyond the world price. Any local rice mill can thus charge any price up to the domestic price level resulting from the import tariff, and remain competitive with imports, as long as the quality of rice is comparable and preferred by the local consumers.

Two, the increase in customs tariffs on rice imports, possibly combined with a decrease in customs tariffs on imported inputs, leads to an increase in the value addition in the domestic rice.

It is also possible to obtain protective effects of customs tariffs by limiting imports through restrictions known as quantitative restrictions, quotas, levies, or import licenses that fix the quantity of rice purchased from abroad. A quota limiting imports to the same quantity as a customs tariff will essentially have the same effect (see Figure 24).

Given a global price of Pw (equal to the customs duty paid (CIF) price), consumers want a quantity Q1; the difference, i.e. M1=Q1-Q2, is then imported.

If an *ad valorem* customs tariff is imposed (proportional) on rice imports and there is perfect elasticity of global supply, the domestic price increases to $P_{d'}$ which reduces the demand for rice to Q_3 and increases the country's rice production. Imports then fall to M_2=Q_3-Q_4. The protection effect created by the increase in domestic rice production from Q_2 to Q_4 results in surplus for the direct VC actors, represented by trapezoid a, and a resource cost, represented by triangle b, since factors of production are affected by the substitution of



Figure 24: Illustration of a tariff protection *Source: Gillis (1998)*

rice imports by local production. A prohibitive tariff will raise the domestic price of rice to $P'_{d'}$ the point at which domestic demand and supply are equal and rice imports are zero.

Now assume that instead of imposing a tariff t_0 , the government limits rice imports to quantity. As with the tariff, the domestic price of rice will remain high until $M_2 = Q_3 - Q_4$; domestic production will increase from to and consumption will fall from to Q_1 to Q_3 .

There are two situations in which the effects of import quotas are different from those of tariffs.

The first situation is where the government of Burkina Faso gives free import licenses to a small number of importers. Even if importers buy rice abroad at a price $P_{w'}$ there is nothing to prevent them from reselling it at a domestic price P_d . Consequently, they retain for themselves a huge profit margin that is equal to $P_d - P_w = t_0$. This is known as a quota or incentive payment. In such cases import licenses will be valuable to importers who will go to great lengths and pay generous commissions to access them.

The second difference between quotas and tariffs is that quotas can increase the monopoly power of local rice mills. Despite high but not prohibitive tariffs, rice imports can continue to flow into the country, and rice mills will still have to compete with imported rice based on price. But if the government decides to convert the tariff to a quota, while allowing the same amount of imported rice to enter, local rice mills will no longer have to compete with importers. Once the quota is filled, no source of supply will compete with local rice. Local rice mills will then be able to use their bargaining power in the market to limit domestic production and impose a monopoly price that is higher than the total of the global price and the tariff, resulting in a loss to consumers and a net loss to the economy.

Due to the double consequences of loss of revenue and a net loss to the economy, trade reforms should favor the imposition of tariffs instead of quotas. Therefore, we will use an increase in tariffs on rice imports to assess the ex-ante effects of implementing quota on imported rice.

Trade policy experiences in Burkina Faso point to the implementation of West African Economic and Monetary Union trade policies, i.e., the common external tariff (CET). Currently, the tariff rate applied on rice imports in Burkina Faso is 10% and under the CET trade measures, Burkina Faso can apply an import tariff of up to 35%. It is assumed that the tax rate on rice imports will increase by 20% from 2025 over ten years, reaching 35% by 2034.

5.3 Ex-ante impact evaluation of productivity gains on the efficiency & competitiveness of the rice sector in Burkina Faso

5.3.1 Impact of productivity gains on value addition of rice

The potential implications of productivity changes resulting from either productivityenhancing investments or other positive exogenous changes (such as a favorable weather or policy environment) on the rice value chainare assessed in terms of their effect on output, producer prices and imports. As mentioned earlier, the short- and long-term effects of these alternative investment options were examined.

Scenario 1: Increased productivity of the irrigated rice sector

The model results show that policies to improve rice productivity, i.e., at the first stage of the rice value chain, lead to higher output gains for the rice value chain because of (i) the positive change in rice returns to investment and (ii) the strong backward and forward linkages they have with the processing and marketing link. We observe that an increase in irrigated rice productivity can lead to an increase in irrigated rice production of 1.84% and 1.39% in the short and long term, respectively (Table 5)

The improvement in irrigated rice production leads to an increase in the output of the rice processing sector by 0.88% in the short term and 1.18% in the long term, and similarly, the output of rain-fed rice increases by 0.26% in the short term and 0.28% in the long term. To some extent the development of irrigated rice is transmitted to the other sectors of the economy. This may be related to the weakness of the rice sector, which has substantially affected the non-agricultural sectors. However, the output gains of the rice sector come at the expense of a reduction in the output of the other agricultural sectors, other industries, and the output of the public administration sector (Table 5), due to the reallocation of production factors to the more efficient rice growing and processing sectors. As a result, despite this marked expansion of the rice sector in Burkina Faso, the other cereal growing and marketing sectors increase by 0.03% and 0.18% respectively in the short term. This increase is small due to a reduction in employment in these sectors.

	Increased	productivi	ty						
		Scen	Scenario 1		Scenario 2		ario 3	Combination of the 3 scenarios	
	Baseline in mil- lion CFA Francs	Short term	Long term	Short term	Long term	Short term	Long term	Short term	Long term
	Change ir	Change in composite output							
Rain-fed rice	33548	0,26	0,28	1,21	1,22	0,01	0,00	1,50	1,53
Irrigated rice	48913	1,84	1,39	2,37	2,39	0,01	0,01	4,28	3,84
Other cereals	576573	0,03	0,02	-0,01	-0,01	0,03	0,06	0,04	0,07
Cash crops	1702438	0,18	0,10	-0,13	-0,13	-0,01	-0,01	0,05	-0,04
Other agriculture	1226036	0,00	-0,01	0,00	0,01	0,00	0,02	0,00	0,02
Rice processing	49381	0,88	1,18	6,45	6,50	-0,02	-0,04	7,44	7,78
Food processing industry	1603417	0,01	0,00	0,00	0,01	0,09	0,12	0,09	0,13
Other industries	3003142	-0,01	-0,01	0,01	0,01	0,14	0,20	0,14	0,20
Hotel and restaurant	271199	0,00	0,01	0,06	0,06	0,19	0,22	0,25	0,29
Transport	346644	0,00	0,00	-0,01	-0,01	5,82	5,34	5,82	5,33
Other private services	3404017	0,01	0,01	0,00	0,01	0,16	0,25	0,16	0,27
Public administration	1956078	-0,02	-0,01	0,01	0,01	-0,01	0,00	-0,02	0,00

Table 5: Impact of productivity gains on production (in %)

Scenario 2: Increased productivity of the rice processing sector

The results of the study show that investments to improve the productivity of the rice processing could lead to a 6.45% increase in sector output in the short term and 6.50% in the long term. This spreads the production gains to the upland and irrigated rice sectors. It is noteworthy that the production gain affects the rice processing and result in an increase in upland rice production of 1.21% in the short term and 1.22% in the long term and an increase in irrigated rice production of 2.37% in the short term and 2.39% in the long term.

Scenario 3: Improving the performance of the transport sector.

The improvement in the transportation sector leads to an increase in the output of the sector of 5.82% in the short run and 5.34% in the long run. This gain in transport sector output is beneficial to the non-agricultural sector, whose output increases. In addition, spillover effects lead to a more rapid increase in the production of other cereals than irrigated and rain-fed rice. Investment in improving the productivity of the transport sector (Scenario 3) does not appear to be a beneficial area of investment for the development of the irrigated rice value chain, as the overall effects on the rice growing and processing sectors range from small to negative. This is due to the limited direct and indirect linkages with the irrigated rice growing and rice processing sectors.

In our model, composite output is a combination of value addition and intermediate inputs under the complementary assumption. The value addition is the important part of the output and the change in the output is transmitted proportionally to the change in value addition. The improvement in value addition shows an attractive return to the different actors, including farmers as suppliers of labor, land and capital. It should also be noted that the gain in value addition is greater in sectors that experience the productivity gain.

The changes in value addition are clearly consistent where production gains are significant. It is worth noting that the rice processing stage, which is the stage of adding value to rice, remains the most effective entry point for rice VC development in Burkina Faso, followed by investments in productivityenhancing technologies for rice farmers. The advantage of supporting the processing sector is that it creates effective demand for rice farmers, so that they will not be discouraged by low or volatile farm gate prices. Finally, when different investment policies are combined, there is an increase in irrigated rice production of 4.28% in the short term and 3.84% in the long term, and an increase in the production of the processing chain of 7.44% in the short term and 7.78% in the long term. Spillover effects caused an increase in upland rice production of 1.50% in the short term and 1.53% in the long term.

5.3.2 Impact of productivity gains on domestic supply and producer prices

There are three rice products that are exported to foreign markets (rain-fed rice, irrigated rice and husked rice). Burkina Faso is not known as a major rice exporter. Given that the level of production is low, we assume a negligible possibility of exporting irrigated and processed rice. We, therefore, analyze the impact of policies on domestic supply.

In line with results on production, productivity improvements in the rice growing and processing sectors are more significant in increasing the supply of rice to the domestic market. The simulation results showed that the domestic supply of irrigated rice could increase by more than 1.95% in the short term and 1.48% in the long term; processed rice could increase by 0.95% in the short term and 1.28% in the long term while by 0.25% in the short term and 0.28% in the long term for rain-fed rice if only irrigated for efficiency (Table 6). Improving the productivity of rice processing is also an achievable strategy since the output is sold in the domestic markets. Thus, the domestic supply of husked rice could increase by 6.96% and 7.02% in the short and long term, respectively. Also, there is no tradeoff in the improving the performance of the domestic supply of the rice sector with other agricultural product supply (e.g., cereals, cash crops). However, due to the lack of backward and forward linkages the policy

of improving the transport sector does not have a substantial effect on the development of the rice sector.

When policies are combined, there is an increase in the domestic supply of irrigated rice of 4.54% in the short term and 4.08% in the long term. In addition, by improving the productivity of the irrigated rice crop, the processing sector and the performance of the transport sector increases the domestic supply of processed rice by 8.04% in the short term and 8.40% in the long term. In addition, domestic supply of upland rice, due to spillover effects, increases by 1.56% in the short term and 1.60% in the long term. The domestic supply of other products also increases.

The improved productivity of rice crops led to a reduction in the price of irrigated paddy rice by 5.07% in the short term and 3.24% in the long term and a decrease in the price of husked rice by 0.71% in the short term and 0.95% in the long term (Table 6). The connection between rain-fed and irrigated rice cultivation causes the price of

	Baseline			I	ncreased	productivi	ty		
	in Million	Sc	cenario 1	So	cenario 2	So	cenario 3	Combine	ed shock
	CFA Francs	Short term	Long term	Short term	Long term	Short term	Long term	Short term	Long term
		C	nange in c	domestic s	upply				
Rain-fed rice	31580	0,25	0,28	1,25	1,27	0,03	0,02	1,56	1,60
Irrigated rice	46049	1,95	1,48	2,51	2,53	0,02	0,01	4,54	4,08
Other cereals	507354	0,02	0,01	0,00	0,00	0,06	0,09	0,07	0,10
Cash crops	362468	0,10	0,06	-0,07	-0,06	0,05	0,07	0,09	0,06
Other agriculture	958595	0,00	0,00	0,00	0,01	0,06	0,08	0,06	0,09
Processed rice	45662	0,95	1,28	6,96	7,02	-0,02	-0,04	8,04	8,40
Food industry	976932	0,00	0,00	0,01	0,02	0,10	0,15	0,11	0,17
Other industries	3006734	0,00	0,00	0,00	0,01	0,16	0,22	0,17	0,23
Hotel and restaurant	271159	0,00	0,01	0,06	0,06	0,19	0,22	0,25	0,29
Transportation	319106	0,01	0,01	-0,01	-0,01	5,42	4,98	5,42	4,98
Other private services	3382480	0,01	0,01	0,00	0,01	0,17	0,26	0,18	0,27
Public administration	1814575	-0,02	-0,01	0,01	0,01	-0,01	0,01	-0,02	0,00
		Cha	nge in pro	oducer prie	ce index				
Rain-fed rice	1	-0,22	-0,12	0,16	0,16	0,29	0,33	0,22	0,37
Irrigated rice	1	-5,07	-3,24	0,13	0,12	0,24	0,26	-4,73	-2,87
Other cereals	1	-0,10	-0,05	0,07	0,07	0,20	0,21	0,17	0,23
Cash crops	1	-0,11	-0,06	0,08	0,08	0,02	0,03	-0,01	0,05
Other agriculture	1	-0,01	0,01	0,02	0,01	0,21	0,22	0,22	0,24
Processed rice	1	-0,71	-0,95	-4,95	-4,98	0,17	0,20	-5,52	-5,74
Food industry	1	0,00	0,01	0,01	0,01	0,14	0,11	0,16	0,13
Other industries	1	0,01	0,01	0,00	0,00	0,15	0,10	0,17	0,12
Hotel and restaurant	1	-0,01	-0,01	-0,07	-0,07	0,14	0,11	0,06	0,02
Transport	1	0,02	0,01	-0,01	0,00	-6,01	-5,47	-6,00	-5,46
Other private services	1	0,04	0,02	0,00	0,00	0,24	0,05	0,28	0,06
Public administration	1	0,02	0,01	0,00	0,00	0,05	0,04	0,07	0,04

Table 6: Impact on domestic supply and output price (%)

rain-fed paddy rice to fall by 0.22% in the short term and 0.12% in the long term if the irrigated rice cultivation sectors become efficient. Policies to improve rice processing productivity are more likely to reduce rice processing prices by 4.95% in the short term and 4.98% in the long term. However, this policy does not result in a price reduction of rain-fed paddy rice and irrigated paddy rice. Finally, the policy of improving the productivity of the transport sector would not improve the rice value chain. However, if the policy is implemented simultaneously, it would benefit producers because the price of irrigated and husked paddy rice would fall by 4.73% and 5.52% in the short term and by 2.87% and 5.74% in the long term, respectively.

5.3.3 Impacts of productivity gains on rice imports

The Table 7 presents the results of the policies to improve technology in cultivation of irrigated rice, processing, and transportation sectors. The policy of supporting productivity improvements in the irrigated rice sector would reduce imports of irrigated rice by 7.63% in the short term and 4.66% in the long term. In addition, the policy would reduce imports of upland rice by 0.17% in the short term. Second, the policy favors a reduction in husked rice imports of 0.33% in the short term and 0.43% in the long term. For this policy, imports of other agricultural commodities are also reduced.

This policy is important in a strategy of import substitution and promotion of the rice value chain in Burkina Faso. In the case of the policy to promote the rice processing sector, imports of husked rice would be reduced by 2.29% in the short term and 2.31% in the long term. If the development of the processing sector is not accompanied by other policies to improve irrigated rice productivity, imports of rice would increase by 2.91% in the short term and 2.92% in the long term to supplement domestic supply.

The performance of the transport sector would lead to an increase in imports of products, especially the various rice products, and only imports of transport products would be reduced by 7.12% in the short term and 6.41% in the long term. Finally, the combined simulation of the three irrigated rice productivity improvement policies would lead to a reduction in rice imports

		Increased productivity								
	Baseline in mil-	Scenario	o 1	Scenario	o 2	Scenari	o 3	Combinat three scer	tion of the narios	
	lion CFA Francs	Short Term	Long term	Short term	Long term	Short term	Long term	Short term	Long term	
Rain-fed rice	800	-0,17	0,05	1,61	1,62	0,59	0,68	2,05	2,38	
Irrigated rice	818	-7,63	-4,66	2,91	2,92	0,48	0,52	-4,50	-1,36	
Other cereals	1311	-0,16	-0,09	0,13	0,13	0,43	0,47	0,39	0,51	
Cash crops	19781	-0,07	-0,04	0,06	0,06	0,11	0,15	0,10	0,18	
Other agriculture	27630	-0,02	0,02	0,04	0,02	0,40	0,45	0,43	0,49	
Processed rice	77510	-0,33	-0,43	-2,29	-2,31	0,30	0,33	-2,36	-2,44	
Food industry	135838	-0,01	0,00	0,04	0,04	0,34	0,36	0,38	0,40	
Other industries	1898770	0,02	0,02	0,01	0,02	0,45	0,43	0,49	0,46	
Transport	191809	0,06	0,03	-0,02	-0,02	-7,12	-6,41	-7,09	-6,39	
Other private services	372880	0,08	0,04	0,00	0,00	0,66	0,36	0,75	0,41	
Public administration	132348	0,02	0,01	0,00	0,00	0,09	0,08	0,12	0,09	

Table 7: Impact of productivity gains on imports

of 4.50% in the short term and 1.36% in the long term, and husked rice imports would decrease by 2.36% in the short term and 2.44% in the long term, and this would help protect the local rice sector.

5.4 The ex-ante impact evaluation of trade policy on the efficiency and competitiveness of the rice sector in Burkina Faso

In this section, specific consideration is given to the implications of a 10% reduction in marketing margins and a 20% increase in rice import tariffs. In addition, it should be noted that Burkina Faso imports rice.

5.4.1 Impacts of trade tariff policies on rice production

The reduction in trade margins and the protection of the rice sector in Burkina Faso have limited effects on production (Table 8). In fact, reducing rice trade margins increases rain-fed rice production by 0.03% in the short term and 0.05% in the long term, and irrigated rice by 0.07% in the short term and 0.11% in the long term. This policy allows for an improvement in the production of the rice processing sector of 0.16% in the short term and 0.27% in the long term.

There is a limited role for marketing margins in the development of the rice value chain. Compared to the productivity shocks analyzed above, the marketing margin has weak effects on the different stages of the rice value chain. As a result, the output of the rest of the cash crop sector could be compromised (Table 8). The import reduction policy improves rice production from irrigated rice by 0.19% in the short term and 0.24% in the long term and increases processed rice production by 0.20% in the short term and 0.34% in the long term.

5.4.2 Impacts of trade tariff policies on domestic supply and producer prices

Policies aimed at reducing marketing margins and tax imports positively affect the domestic supply of irrigated and husked rice (Table 9).

	Baseline in	Reduced tra	Reduced trade margins and increased import duties on rice							
	Francs	Scenario 4		Scenario 5		Combinatic scenarios	Combination of the 2 scenarios			
		Short term	Long term	Short term	Long term	Short term	Long term			
			Variatior							
Rain-fed rice	33548	0,03	0,05	0,03	0,06	0,06	0,11			
Irrigated rice	48913	0,07	0,11	0,19	0,24	0,26	0,35			
Other cereals	576573	0,00	0,00	0,00	0,00	0,00	0,01			
Cash crops	1702438	0,00	-0,01	-0,01	-0,01	-0,01	-0,02			
Other agriculture	1226036	0,00	0,00	0,00	0,01	0,00	0,01			
Rice processing	49381	0,16	0,27	0,20	0,34	0,37	0,62			
Food processing industry	1603417	0,00	0,01	0,01	0,01	0,01	0,01			
Other industries	3003142	0,00	0,01	0,00	0,00	0,00	0,01			
Hotel and restaurant	271199	-0,01	-0,01	0,02	0,02	0,01	0,01			
Transport	346644	0,00	0,00	0,00	0,00	0,00	0,00			
Other private services	3404017	0,00	0,00	-0,01	-0,02	-0,01	-0,01			
Public administration	1956078	0,00	0,00	0,01	0,01	0,00	0,00			

Table 8: Impact of Reduced Trade Margin and Higher Import Tariffs on Rice Production (%)

	Baseline in mil- lion CFA	line Reduced trade margins and increased import duties on rice il- CFA							
	Francs	Scenario 4		Scenario 5		Combin	ed Scenario		
		Short term	Long term	Short term	Long term	Short term	Long term		
		Char	nge in domest	tic supply					
Rain-fed rice	31580	0,04	0,06	0,03	0,05	0,07	0,12		
Irrigated rice	46049	0,20	0,25	0,08	0,12	0,27	0,37		
Other cereals	507354	0,01	0,00	0,00	0,00	0,01	0,01		
Cash crops	362468	0,00	0,00	0,00	0,00	0,00	-0,01		
Other agriculture	958595	0,00	0,01	0,00	0,00	0,00	0,01		
Processed rice	45662	0,22	0,37	0,18	0,30	0,39	0,67		
Food industry	976932	0,01	0,01	0,00	0,00	0,01	0,01		
Other industries	3006734	0,00	0,00	0,00	0,01	0,01	0,01		
Hotel and restaurant	271159	0,02	0,02	-0,01	-0,01	0,01	0,01		
Transport	319106	0,00	0,00	0,00	0,00	0,00	0,00		
Other private services	3382480	-0,01	-0,02	0,00	0,00	-0,01	-0,01		
Public administration	1814575	0,01	0,01	0,00	0,00	0,00	0,00		
		Change	e in producer	price index					
Rain-fed rice	1	0,00	0,01	0,03	0,02	0,03	0,03		
Irrigated rice	1	0,00	0,01	0,00	0,00	0,01	0,01		
Other cereals	1	0,00	0,00	0,01	0,01	0,01	0,01		
Cash crops	1	0,00	0,00	0,01	0,01	0,01	0,01		
Other agriculture	1	0,00	0,00	0,01	0,00	0,02	0,00		
Processed rice	1	0,23	0,14	0,12	0,01	0,35	0,14		
Food industry	1	0,00	0,00	0,00	0,00	0,00	0,00		
Other industries	1	0,01	0,00	0,00	-0,01	0,00	0,00		
Hotel and restaurant	1	0,03	0,02	-0,03	-0,04	-0,01	-0,01		
Transport	1	0,00	0,00	-0,01	-0,01	-0,01	-0,01		
Other private services	1	0,01	0,00	-0,04	-0,02	-0,03	-0,02		
Public administration	1	0,00	0,00	-0,01	-0,01	0,00	0,00		

Table 9: Impact of Reducing Trade Margins & Increasing Import Tariffs for Rice on DomesticSupply& Producer Price Index

Source: Author's compilation

The domestic supply of irrigated rice increases by 0.27% in the short term and by 0.37% in the long term. Similarly, domestic supply of husked rice increases by 0.39% in the short term and 0.67% in the long term when the two policies are implemented together. There is a slight increase in sectoral output prices as shown in Table 9.

5.4.3 Impacts of trade tariff policies on rice imports

The Table 10 presents the results of simulations of reducing rice marketing margins and increasing rice import tariffs. An increase in rice import tariffs, which is the main measure of the import substitution policy, would reduce rice

	Baseline in mil-	Reduced tra	ide margins a	and increased	l import dutie	es on rice	
	lion CFA Francs	Scena	ario 4	Scena	ario 5	Combined scenario	
Products		Short term	Long term	Short term	Long term	Short term	Long term
Rain-fed rice	800	0,09	0,11	0,03	0,07	0,12	0,18
Irrigated rice	818	0,20	0,25	-0,72	-0,67	-0,52	-0,42
Other cereals	1311	0,02	0,02	0,00	0,01	0,03	0,03
Cash crops	19781	0,01	0,01	0,00	0,00	0,01	0,01
Other agriculture	27630	0,02	0,00	0,01	0,00	0,03	0,00
Processed rice	77510	0,42	0,37	-0,51	-0,55	-0,09	-0,19
Food industry	135838	0,01	0,00	0,00	0,00	0,01	0,01
Other industries	1898770	0,00	-0,01	0,02	0,02	0,01	0,01
Transport	191809	-0,02	-0,02	0,00	0,01	-0,01	-0,01
Other private services	372880	-0,09	-0,06	0,01	0,01	-0,07	-0,06
Public administration	132348	-0,01	-0,01	0,01	0,01	0,00	0,00

Table 10 : Impact of Reducing Trade Margins and Increasing Import Tariffs on Rice Imports

Source: Author's compilation

imports. For an increase in the import tax rate on rice of 20% per year, imports of irrigated rice would decrease by 0.72% in the short term and 0.67% in the long term, while imports of husked rice would decrease by 0.51% in the short term and 0.55% in the long term. However, imports of other products have shown an increase as shown in Table 10. The reduction of trade margins policy is not favorable to reducing rice imports in the short or long term. However, this policy would reduce imports and other private services products.

5.5 The ex-ante impact evaluation of the import substitution policies on welfare gains

5.5.1 Impact on Household welfare

The Table 11 presents the results of the different policy scenarios of improving productivity, reducing rice margins and increasing the import tax rate on rice on real household consumption. Thus, real household consumption measures the total annual quantity consumed per household. The change in quantity of household consumption provides an understanding of the effect of the different policies. Overall, various policies have a positive effect on real household consumption in Burkina Faso. Indeed, the increase in productivity of irrigated rice cultivation led to a reduction of workers in the agricultural sectors hence reduced farm.

The reduction in farm labor income explains the decline in real consumption by poor rural households. The same is true for the policy on increasing import tariffs on rice, which by reducing the volume of imports would reduce real household consumption. Similarly, an increase in import tariffs contributes to an increase in the price of goods and services and therefore negatively affects the demand of households, especially the poor.

As far as the policy of increasing the productivity of irrigated rice cultivation is concerned, it is the rural households that experience a decrease in their real consumption level due to the reduction in employment. Since irrigated rice cultivation has become beneficial, this has led to the migration of labor from other agricultural sectors to the irrigated rice sector, leading to a decline in the salary level within the sector.

		Poor rural households	Households urban poor	Households rural non-poor	Households urban non-poor
Baseline in milli	on CFA Francs	749110	90177	2637516	2247663
Scenario 1	Short term	-0,08	0,02	-0,01	0,05
	Long term	-0,03	0,02	0,00	0,03
Scenario 2	Short term	0,09	0,03	0,05	0,01
	Long term	0,09	0,03	0,05	0,02
Scenario 3	Short term	0,15	0,18	0,16	0,16
	Long term	0,23	0,22	0,22	0,19
Scenario 4	Short term	0,04	0,02	0,02	0,01
	Long term	0,03	0,01	0,02	0,01
Scenario 5	Short term	-0,01	-0,01	-0,01	-0,01
	Long term	-0,01	0,00	0,00	0,00

Table 11. Impact on real household consumption

Source: Author's compilation

In turn, this decline in salary levels leads to a reduction in labor income in the rural sector, resulting in lower consumption by poor rural households. It is noted that the policy of improving productivity in the transport sector is more beneficial to households in terms of real consumption because of the increase in household income.

5.5.2 Impact on economic growth

A simulation of the effect of various policies on the real GDP growth in Burkina Faso is shown in Table 12. Among the simulated policies, improving the productivity of the transport sector impacts the growth to the economy the most, followed by the policy on investing in improved productivity of irrigated rice and supporting the efficiency of the rice processing. In addition, the increase in real GDP is related to the increase in investment spending that the various policies would require.

The increase in real GDP, especially in the context of improved performance in the transport sector, is mainly related to the increase in demand for capital and the importance of the sector in the economy. In addition, an increase in the performance of the transport sector accelerates the growth of other sectors of the economy and an increase in employment.

		Real GDP	Capital expenditure	Consumer Price Index	Government revenue
Baseline in million CFA Francs		8,920,421,283	199,601,300	1	231,911,900
Scenario 1	Short term	0,03	0,02	-0,03	0,01
	Long term	0,02	0,01	-0,02	0,00
Scenario 2	Short term	0,03	0,01	-0,02	-0,01
	Long term	0,04	-0,01	-0,02	-0,01
Scenario 3	Short term	0,19	0,46	0,11	0,24
	Long term	0,23	0,41	0,06	0,21
Scenario 4	Short term	0,02	-0,02	-0,02	-0,02
	Long term	0,01	-0,02	-0,02	-0,01
Scenario 5	Short term	0,00	0,04	0,01	0,03
	Long term	0,00	0,04	0,01	0,03

Table 12: Impact of the promotion of the irrigated rice sector policy on macroeconomic variables

Except for the policy of reducing trade margins, where investment spending decreases because of the reduction in the demand for capital, the other policies would require capital, meaning that investment spending increases in both the short and long run.

An increase in output productivity related policies would lead to a reduction in the consumer price index thus beneficial to consumers. Policies to improve the performance of the transport sector and to raise import tax rates would lead to an increase in consumer prices, especially in the short run. Finally, the various policies have positive effects on government revenue because of the increase in tax revenue.

5.5.3 Impact on poverty

To analyze poverty, the usual indicators of Foster et al (1984) were used. Three indicators are thus defined: the incidence of poverty (P_0), the depth of poverty (P_1) and the severity of poverty (P_2). The Table 13 presents the results of the impact of increased productivity of the rain-fed and irrigated rice, efficiency of the rice processing sector, efficiency of the transport sector, reduced trade margins and increased import tariffs.

According to the 2018 Harmonized Survey of Household Living Conditions (HSLC), the poverty rate is 41.4% at the national level, 13.2% in urban areas and 51.1% in rural areas for a poverty threshold of 194,629 FCFA per year. According to the projected performance of Burkina Faso's

	BAU	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Population groups		Short term	Short term	Short term	Short term	Short term
		Per cap	oita poverty (P_0)			
- Urban	9.4	9.4	9.3	9.3	9.3	9.3
- Rural	42.0	41.9	41.8	41.8	42.0	41.8
Population	33.6	33.6	33.5	33.5	33.6	33.5
		Pov	erty gap (P ₁)			
- Urban	2.3	2.3	2.3	2.3	2.3	2.3
- Rural	11.4	11.4	11.4	11.4	11.4	11.4
Population	9.1	9.1	9.0	9.0	9.1	9.1
		Severit	y of poverty (P_2)			
- Urban	0.8	0.8	0.8	0.8	0.8	0.8
- Rural	4.4	4.3	4.3	4.3	4.4	4.3
Population	3.5	3.5	3.5	3.5	3.5	3.5
Population groups	Long term	Long term	Long term	Long term	Long term	Long term
		Per ca	oita poverty (P_0)			
- Urban	7.5	7.5	7.5	7.5	7.5	7.5
- Rural	35.1	35.1	35.1	35.1	35.1	35.1
Population	28.0	28.0	28.0	28.0	28.0	28.0
		Pov	rerty gap (P ₁)			
- Urban	1.8	1.8	1.8	1.8	1.8	1.8
- Rural	8.9	8.9	8.9	8.8	8.9	8.9
Population	7.1	7.1	7.0	7.0	7.1	7.0
		Severit	y of poverty (P_2)			
- Urban	0.6	0.6	0.6	0.6	0.6	0.6
- Rural	3.3	3.3	3.2	3.2	3.3	3.3
Population	2.6	2.6	2.5	2.5	2.6	2.5

Table 13: Impact of productivity gains and trade policies on the poverty rate

economy, i.e., economic growth of 7% per year between 2022 and 2025, the incidence of poverty would be 33.6% in 2022 and 28.0% in 2025.

The results of the simulations show that productivity gains in the rice sector and the reduction of trade margins would reduce the poverty incidence rate by about 0.1 percentage points in the short term respectively. Similarly, for these policies there is a slight reduction in the depth of poverty and the severity of poverty. This is due to the decline in consumer prices. As noted above, these policies are critical to the development of the rice sector.

Any investments to increase the productivity of the transport sector and increase the import tariff would reduce poverty in urban and rural areas. The simulated policies do not result in long-term poverty reduction. It is observed that simulated policies are favorable to poverty reduction, especially in rural areas. However, the small size of the irrigated rice sector means that the spillover effects are limited to bring about a significant reduction in monetary poverty, especially since certain investment options are responsible for price increases and reductions in production in other sectors including employment.

5.6 Operationalization of the rice import substitution policy

5.6.1 Implementation model for the rice import substitution policy

The implementation model for the rice import substitution policy in Burkina Faso will be based on a set of instruments aimed at increasing the productivity of Burkina Faso's rice, ensuring profitability of rice mills through introduction of tariffs and access to low-cost inputs to improve competitiveness with imported rice. The implementation model should be based on the following measures:

o Increasing paddy production and processing capacity through public-private partnerships.

The government should therefore create incentives to promote public-private partnerships in rice production and processing.

- o Upgrading the existing rice mills for improved quality and quantity rice.
- Establishment of tariff barriers. The tariff barriers will include a gradual increase in tariffs on imported rice to a rate of 35%, by the CET. The increase in tariffs will be based on the ability of rice VC actors to meet the quantity and quality needs of consumers.
- Combining imports with local purchases through the involvement of importers who are committed to absorbing the entire local production to meet their quantitative rice needs while considering the quota allocated by the Ministry of Trade. Indeed, the quota volume set by the Ministry in charge of agriculture will consider the annual performance of the rice value chain, with a variation of these volumes according to the gap that needs to be filled between global demand and domestic production.
- Strengthening of the agricultural development fund to finance the rice value chain actors aimed at availing credit under a favourable policy environment.

5.6.2 Institutional structure to coordinate rice import substitution policy.

The institutional management structure for coordinating the rice import substitution policy is based on the following bodies: 1). The inter-ministerial unit, 2) The marketing and regulation of the rice imports platform, and 3) The consultation and discussion platform for agricultural zones. See Table 14.

The institutional bodies for coordinating the rice import substitution policy are at different hierarchical levels, ranging from the local to the national level, with different roles and functions. While the agricultural zone-level consultation and discussion platform are focused on implementation and learning, the marketing platforms, and

Table 14: Roles and Functions of the institutional management Body for coordinating rice import substitution policy

Organs	Objectives	Composition	Role and responsibility
Inter-ministerial unit	 Provide strategic guidelines for the development of the sector. 	Prime Minister's Office	Facilitating consultations
	• Set rice import quotas if needed.	Ministry in charge Each party provides information related to its	
	 Provide incentives to promote private investment in the rice VC. 	Ministry of Agriculture	istry of area of expertise iculture keting and ulation platform
	 Coordinate and ensure synergy of various project/program activities dealing with issues related to capacity building of rice VC actors. 	Marketing and regulation platform	
	• Monitor the implementation of the rice import substitution policy.		
	• Create an enabling environment		
The marketing and regulation of rice imports platform in Burkina Faso	 Promote efficient marketing of national rice products. 	Ministry in charge of trade	Facilitate discussions between the stakeholders.
	 To promote dialogue and information exchange between the direct and indirect actors in the sector. To act as an intermediary between producers, traders and the government. Debate rice sub-sector policy and monitor its implementation. Undertake advocacy on key issues concerning rice VC operations (e.g., inputs, services and provision of market information by the private and public sectors, market policies and regulations, etc.) Collect regular production and market data and information. To be a permanent advisory body: 	Ministry of Agriculture	Co-facilitate the platform
		Agricultural zones management structure	Provide regular statistics on rice production (quantity and quality) and market.
		Inter-professional Rice Committee of Burkina Faso (CIR-B)	To provide information on the quantity of paddy processed and in stock. To tackle conflict and
			dispute management c amicable
		Rice importers and distributors	Buy local rice in proportion to its market share of imported rice. Market shares are determined by the average of the last three years of imports.
		Banking groups (CBI, ECOBANK, VISTA BANK, BOA, BADF etc.)	Facilitate credit for importers/traders or processing units.
The consultation and discussion platform for agricultural zones	Facilitate increased interaction between actors at the local level.	Producer organizations	All stakeholders regularly participate in discussions to identify and address opportunities and threats to improve the overall competitiveness of the rice VC.
	Facilitate joint learning.	Processing units	
	Discuss production and marketing constraints.	Local financial institutions	
	Find solutions and implement them in a coordinated manner.	Local agricultural service providers	
	Feedback data and information to the regulatory platform.	Agricultural zones management structures	
		Input suppliers	
		Development support organizations	

the inter-ministerial units play an important role in overall coordination, identification, and policy as well as internal and external scaling-up of best practices and lessons learned.

5.7 Conclusion and Recommendation

The implementation of the rice import substitution policy in Burkina Faso will be based on a set of instruments aimed at increasing the productivity of Burkina Faso's rice, ensuring profitability of rice mills through introduction of tariffs and access to low-cost inputs to improve competitiveness with imported rice.

The value chain analysis shows a greater role for productivity-enhancing policy in the upland and irrigated rice crops and processing sector in enhancing the performance of the rice sector. This study further proposes a growth strategy focused on production and processing with incentives that can stimulate pre-marketing development to optimize the benefits of import substitution. The results show that reducing imports requires significant domestic production and an efficient processing system. It also requires a reduction in trade margins to control domestic price volatility, which is a challenge for the rice VC to ensure its global competitiveness.

The results of the model also suggest a small potential decline in the production of other cash crops, due to competition for resources and a shift in inputs such as labor and land in the rice sectors that are experiencing productivity gains. Existing literature has shown a competitive relationship between cash crops and food crops due to resource allocation (von Braun, 1995). The same reasoning applies to the apparent decline in the performance of other cash crops when simulating an increase in the productivity of the rice sector in Burkina Faso. Other than improving the productivity of rice cultivation, priority should be given to providing incentives which would (i) reduce the high margins between the price of rice at the rice field and the distribution price, and (ii) increase the share of rice processed at the national level. Difficulties in accessing credit are obstacles to local rice development. Consequently, easing these constraints would promote local processing and increase the benefits to rice producers.

The study reveals that a trade policy reform that would raise the level of taxation on imports would address the problem of price competitiveness of local rice in the short term by reducing rice imports. However, this would be less than the decrease in rice imports brought about by productivity gains in the production and processing sectors.

Recommendations

- Increasing paddy production and processing capacity through public-private partnerships. The government should therefore create incentives to promote public-private partnerships in rice production and processing.
- Upgrading the existing rice mills for improved quality and quantity rice.
- Establishment of tariff barriers to include a gradual increase in tariffs on imported rice to a rate of 35%, by the CET. The increase in tariffs will be based on the ability of rice VC actors to meet the quantity and quality needs of consumers.
- Strengthening of the agricultural development fund to finance the rice value chain actors aimed at availing credit under a favorable policy environment.

6 Conclusion

The importance of rice production in relation to food security in Burkina Faso cannot be overemphasized. The rice value chain provides a lifeline for thousands of people. The demand of rice has increased due to the fast population growth, especially in urban areas. Local production is not always able to match demand despite efforts by the government and partners over the past few decades. As such, the country largely resorts to massive and costly rice imports, which underscores the need to study the rice value chain in Burkina Faso and to identify ways and means to strengthen it.

In 2020, the government of Burkina Faso launched the presidential initiative entitled *"Produce one million tons of paddy".* To support this initiative, the government plans to introduce a policy of raising tariffs and/or non-tariff barriers in the coming years to reduce the country's dependence on rice imports. It is in this regard that this study was commissioned to provide scientific evidence for informed decision-making by the government of Burkina Faso.

The value chain analysis revealed that the rice value chain in Burkina Faso is dynamic with a growing number of actors, from the production to the consumption sectors, as well as input suppliers. All these actors are market driven. The producers, processors, traders/exporters, and consumers face certain constraints and major tensions that need to be addressed to strengthen the overall competitiveness of the rice value chain in Burkina Faso.

Three strategies identified to enhance the overall competitiveness of the entire rice value chain in Burkina Faso include:

 Upgrading processes by reorganizing the production system and introducing technology: adopting more efficient rice systems such as irrigated rice, facilitating access to improved seeds and quality fertilizers, investing in new and more efficient processing technologies, upgrading products: moving to more specific product ranges that meet consumers' needs.

- Functional upgrading: acquiring new functions to increase the skills of certain activities by integrating large rice importers into the chain and removing certain functions such as collection and marketing for the export market.
- Promotion of policies that will encourage and support investments in semi-industrial or industrial processing technologies, technologies that will significantly improve the quality of husked rice. There is also a need to move towards integrated forms of governance such as competitive market outlets and agribusiness clusters.

The investigation of the rice value chain provided the ex-ante impact assessment of the different policy interventions. The results showed that productivity improvement policies have greater effects on rice production and imports if they target the production stage of the value chain, followed by the processing stage. Investments to improve the rice transport chain do not seem to be an ideal priority area for the value chain development because the overall effects on the rice chain are small. This is due to the weak back- and forward linkages in rice transport within the current commodity chain structure. This points to the role of incentives that would (i) reduce the high margin between the farm gate price and the distribution price and (ii) increase the share of locally processed rice.

However, the study found that these gains in both rice production and imports come at the expense of the performance of other cash and food crop sectors. The approach taken in this study is relevant because this trade-off between rice production and the performance of other cash crop sectors may not be captured by standard value chain approaches. Thus, this trade-off in production reveals distortions in the distribution of resources in the implementation of the rice policies.

The findings of the study highlight the need to address the challenges and constraints faced by rice value chain stakeholders. The government should adopt a series of policies that would increase the productivity of the rice value chain and processing as well as create an enabling environment for increased private sector participation. Although the government of Burkina Faso has import tariffs on rice, it should continue to protect the sector to enable the development of a successful rice processing sector. Necessary support must be provided to rice farmers and processors. This can be done by facilitating access to affordable credit through the implementation of the following measures by the government of Burkina Faso:

In the short term

- Offer fiscal incentives to attract the private sector in investing along the rice value chain (production and processing)
- Implement a program to upgrade existing rice mills.
- Establish a mechanism for setting an official paddy price through an inter-ministerial decree, which should be determined each year in consultation with the main actors in the rice sector under the CIR-B umbrella, taking into account the production and marketing costs of the product.
- Strengthen the agricultural development fund's ability to support the financing needs of rice value chain actors.
- Establish a multi-level mechanism for effective management of the import substitution policy. Institutional management bodies for coordinating rice import substitution policy should be established- from local to national level.

In the medium and long term

- Establish tariff and non-tariff barriers. Tariff barriers are set by CET.
- Set up a mechanism for combining imports

with local purchases through the involvement of importers who commit themselves to purchasing all the local production to complete their quantitative rice needs while considering the quota allocated by the Ministry in charge of trade.

To ensure transparency of the rice import substitution policy, the government will need to ensure that the following measures are in place:

- Effective partnership management is crucial: it refers to process and content management within the different bodies. For example, facilitating meetings of the bodies, monitoring activities between meetings, and building and managing relationships between stakeholders in the different bodies. Platform facilitation (stakeholder interactions and relationships) is one of the critical factors for the success of substitution policy management platforms.
- Establishment of a memorandum of understanding between the stakeholders of the marketing and import regulation platform.
- Introduce guidelines and standards of rice products and ensure adequate supply of rice in terms of quantitý and qualitý (varietal authenticitý, homogeneitý, moisture content, impurity levels and other aspects)
- Ensure a conducive policy environment that promotes competitiveness along the rice value chain.
- Establishment of incentives to invest in improving productivitý (including rice yields), quality and food security.
- A commitment by distributors of imported rice to source locally produced rice, using contracts with local processors and farmers. This can be in the form of quotas or other arrangements to match imports with local purchases, as well as adequate and inclusive investment incentives to build processing, storage, and distribution capacity (e.g., guaranteed credit lines);
- Better organization of public procurement to promote purchasing of locally produced rice (to supply public schools, hospitals, the army, prisons, and also humanitarian aid organizations)

7 | References

- AGRA (2021) Burkina Faso : projet de transformation structurelle de la filière riz grâce aux agropoles dans le grand Ouest. Rapport de formulation. AGRA, Burkina Faso.
- Aragie, E. (2018). Identifying opportunities for value chain development in the kenyan coffee sector: A modelling approach. *Outlook on Agriculture*, 47(2), 150–159. https://doi.org/10.1177/0030727018766956
- Bibi, S., Cockburn, J., Tiberti, L., Fofana, I., Centre, U. I. R., & Office, U. W.-W. and C. A. R. (2010). Impacts of the Global Crisis and Policy Responses on Child Well-being: A macro-micro simulation framework (Working Papers inwopa602; Issue May). http://ideas.repec.org/p/ucf/ inwopa/inwopa602.html
- Cockburn, J., Maisonnave, H., Robichaud, V., Tiberti L. (2016). Fiscal space and public spending on children in Burkina Faso, International Journal of Microsimulation, 9(January), 5-23. https://doi.org/10.1093/jae/ejm037.
- Decaluwé, B., Lemelin, A., Robichaud, V., & Maisonnave, H. (2013). pep -1- t the PEP standard singlecountry, recursive dynamic CGE model (Université Laval (ed.); Vol. 0, Issue May 2012). Partnership for Economic Policy.
- Diao, X., Nwafor, M., Alpuerto, V., Akramov, K., & Salau, S. (2010). Agricultural Growth and Investment Options for Poverty Reduction in Nigeria. In *IFPRI Discussion Paper 00954* (Issue February). https://doi.org/10.2139/ssrn.3977903
- Foster, J., Greer, J., & Thorbecke, E. (1984). A class of decomposable poverty measures. *Econometrica*, *52*(3).
- Gillis, M. (1998). Economie du développement. Paris, Bruxelles: De Boeck Université.
- Jung, H. S., & Thorbecke, E. (2003). The impact of public education expenditure on human capital, growth, and poverty in Tanzania and Zambia: A general equilibrium approach. *Journal of Policy Modeling*, *25*(8), 701–725. https://doi.org/10.1016/S0161-8938(03)00060-7
- Kambou, D. (2019). Évaluation des performances techniques de l'irrigation au Burkina Faso. Université de Liège, 166.
- MAAH (2016) Matrice de comptabilité sociale Burkina Faso de 2013, Rapport non publié, Burkina Faso. Ministère de l'Agriculture et des Aménagements hydro-agricoles.
- McDermott, A., Dooley, A. E., & Smeaton, D. C. (2005). Identifying opportunities to add value to the New Zealand beef industry; a modelling approach. *NZ Soc Anim Prod Proc*, 65, 252–255.
- Teravaninthorn, S., & Raballand, G. (2009). Infrastructure Transport Prices and Costs in Africa A Review of the International Corridors. https://openknowledge.worldbank.org/bitstream/ handle/10986/6610/461810PUB0Box3101OFFICIAL0USE0ONLY1.pdf?sequence=1
- Tiberti, L., Cicowiez, M., & Cockburn, J. (2018). A Top-Down with Behaviour (TDB) Microsimulation Toolkit for Distributive Analysis. *International Journal of Microsimulation*, 11(2), 191–213.
- Van Campenhout, B., Pauw, K., & Minot, N. (2018). The impact of food price shocks in Uganda: First-order effects versus general-equilibrium consequences. *European Review of Agricultural Economics*, 45(5), 783–807. https://doi.org/10.1093/erae/jby013
- von Braun, J. (1995). Agricultural commercialization: impacts on income and nutrition and implications for policy. *Food Policy*, *20*(3), 187–202. https://doi.org/10.1016/0306-9192(95)00013-5
- You, L., Ringler, C., Wood-sichra, U., Robertson, R., Wood, S., Zhu, T., Nelson, G., Guo, Z., & Sun, Y. (2011). What is the irrigation potential for Africa ? A combined biophysical and socioeconomic approach. *Food Policy*, *36*(6), 770–782. https://doi.org/10.1016/j.foodpol.2011.09.001

8 Appendixes

Appendix 1: Forecast analysis model

Simple reponential smoothing

A basic algorithm for forecasting universite time series is exponential smoothing, which is the oldest method.

Exponential emoothing can be seen as a forecasting method but also, as its name indicates, as a data smoothing technique.

Definition: let be a time series y_t . The process y_t) "defined as follows is called simple exponential smoothing of parameter $x \in [0, 1]$ of this series:

$$f_{t+1/t} = a_{2t} + (1 - a)f_{t,n-1}$$
 (1)

We than have:

The forecast at t+1 is thus a weighted sum of the part values of the series, with the weights decreasing exponentially in the part. The memory of the forecast depends on w. The closer w is to 1 the more recent observations influence the forecast, conversely if w is close to 0, this leads to a vary stable forecast taking into eccount a distant pest.

Exponential smoothing can be rewritten as follows:

Double exponential (or Holt) smoothing

Holt (1957) extended simple exponential emoothing to the case of linear exponential smoothing. The idea is to fit a line to the (Goude, 2029) (Holt, 2004) place of a constant in the local approximation of the series.

Definition: let a time series <u>y_t</u>. The process <u>(y_t</u>)*defined as follows is called double exponential (or Holt) emoothing of parameter $\alpha \in [0, 1]$ of this series:

$$f_{t+h/t} = i_t + hb_t \tag{4}$$

With

$$\begin{cases} l_{t} = l_{t-1} + b_{t-1} + (1 - (1 - a)^{2})(y_{t} - \beta_{t_{t} t_{t-1}}) \\ b_{t} = b_{t-1} + a^{2}(y_{t} - \beta_{t_{t} t_{t-1}}) \end{cases}$$
(5)

- -

 l_t et b_t minimize et ell times:

$$(l, b) = \arg\min_{k, b} \sum_{i=1}^{n} (1 - n)^{i} (p_{i-1} - (l - b_{i}))^{2}$$
 (6)
Holt-Winters expanential smoothing

Holt-Winters generalizes the double amoothing, and allows to propose the following models:

- local mean trend;
- local linear trend + seasonality (additive model);
- local linear trend * seasonality (multiplicative model).

Here, two smoothing parameters come into play and a linear function

It + hbt, h being the forecast horizon.

Definition: let us consider a time series y_t . We call the process (y_t)^{*} of this series Holt-Winters clouble exponential amonthing of parameters $x \in [0, 1]$ and $\beta \in [0, 1]$ defined as follows:

With

 $f_{\rm f}$ is an astimate of the level of the series, b t of its slope (locally in time).

Exponential smoothing is easily used in Excel and is obtained by the function FREVISIONLETS ().

Appendix 2. Composition of rice food balance sheet

The food balance for rice has as main components as listed in Table 1 below.

Table 1: Main taens in the food balance for Rice (Take Table 1 to Anner)

POSITION	CALCULATION FORMULA
1. AVALABILITY	- Austlable output + Initial Stock
(Grass Production (Year N-1/N)	
 Available output 	– Gross output × 55%
 Initial stock (As at 01/11/N-1) 	- Farmers' stock + Other stock
-> Farmas' stock	
→ Other Stock	
2. NEEDS	- Humm Consumption + Final Stock
[Consumption Standards (Kg/Hbt/Yr]	
e Human consumption	- Commution standard × Population
• Final work (Au 31/10/N)	- Farmers' stock + Other stock
→ Farmans' Stock	
→ Other Stock	
1. GROSS SURPLUS(+)/DEFICIT(-)	— Avalinbility — Hesds
4. IMPORT/EXPORT BALANCE	= Importations + Aides - Exportations
Tracle Imports (N-1/N)	
-> Privata tradem	
Other Imports	
• Food eld	
 Expected expansion 	
5. NET SURPLUS(+YDEFICIT(-)	- Gross curptus + Import/Export balance
& APPARENT AVAILABLE/HBT(KG)	= Cark + Balance Import/Export Population × 1000

Appendix 3: General structure of the ex-ante evaluation model of the impact of the import substitution policy

Methodology

Computable general equilibrium modeling

This study employed a variant of the dynamic version of the standard PEP 1-t computable general equilibrium (CGE) model which was developed by Decaluwé et al., (2013), and the microsimulation model proposed by Tiberti et al., (2018). The structure of the model is based on the neoclassical general equilibrium paradigm. Producers maximize their profit under the technological and independent price constraints. Each production sector has an interrelated production structure where output is represented in a four-level process.

At the first level, total output by industry is the fixed combination of total value added and intermediate consumption. In other words, aggregate inputs are considered as strictly complementary, in accordance with the Leontief production function. Second, total value added per economic sector is a combination of composite labor and composite capital. Third, composite labor is the combination of different categories of labor (family labor, salaried agricultural labor and non-agricultural labor) based on a Constant Elasticity of Substitution (CES) function. Finally, the demand for composite capital is a CES function between the different categories of capital (farm capital and non-farm capital).

The model is characterized by various types of institutions e.g. Firm, household and Government, the World. A representative household receives income from capital and labor, as well as transfers from other institutions. Households pay direct taxes to the government and spend their disposable income on consumption and savings. Household consumption follows a Linear Expenditure System (LES) type demand function derived from maximizing the Stone-Geary utility function. The Stone-Geary utility function is extended by incorporating leisure time (of women and men) and consumption of non-market household goods and market goods. The income of firms includes their share of capital income and, transfers received from other agents. They pay dividends to various institutions, pay direct taxes to government and make savings. The Government revenues comes from direct taxes on households and businesses and indirect taxes on activities and commodities. In other words, firms make transfers to other agents, buy products, and save. Finally, income from the rest of the world comes from its sales in the Burkina Faso market, capital, and transfers from other institutions. The rest of the world buys products and makes transfers to domestic institutions. The difference between the rest of the world's expenditures and income is the current account balance.

On the supply side, domestic production is sold on the domestic market or traded abroad. Supply is modeled using a CES function that characterizes the imperfect substitutability between products sold on the domestic market and products sold on the external market. The constant elasticity of transformation (CET) function determines the extent of choice between domestic supply and exports. On the demand side, consumers can buy domestic or imported products. Their choice will be influenced by the relative prices between domestic and imported products, as well as the elasticity of substitution between imported and domestic products.

The nominal exchange rate is the dummy of the model. Burkina Faso is considered a small country and therefore has no influence on world prices. As a result, world prices for all products are fixed. It is further assumed that the current account balance is fixed, which shows that Burkina Faso cannot borrow as much as it wants from the rest of the world. Capital is mobile between activities, which represents a long-term situation where the economy has time to adjust.

The model's underlying dynamic is the growth in the supply of production factors. Labor supply, like most exogenous variables, grows at the rate of population growth. The capital stock is equal to its previous period's level, minus depreciation, plus new investments. To account for the effects of climate change, such as floods and droughts, the rate of depreciation of land capital takes into account the level of soil erosion. This is significant because the productivity of the agricultural sector depends on the degree of soil fertility and the more the soil is affected by climatic hazards, the lower the productivity of the land.

Microsimulation model

This study builds on the Tiberti *et al.* microsimulation model, (2018). The distributional and welfare effects of rice sector expansion and rice product revenue management options are captured by a microsimulation module combined with a computable general equilibrium model. This procedure is particularly important because the CGE model is not able to take into account the changing inequalities within a subgroup of the population. To do so, a top-down macro-micro simulation approach is adopted, integrating the households' micro behaviors. As a result, household behaviors can then be affected by policy options and changes over time.

Microeconomic modeling makes it possible to identify which individual, region or population group would be affected by macroeconomic changes. The results of the CGE model on prices, employment and income are used as inputs to the microeconomic analysis. The main objective of the microsimulation model is to conduct a poverty and income redistribution analysis based on the CGE model.

The microsimulation module is consistent with the analysis of poverty and real income distribution (Bibi et al., 2010). To observe changes in the level of household consumption following changes in the prices of goods and services and household income, nominal household consumption for each product is converted to real consumption. A Cobb-Douglas utility function, which has the fixed budget share assumption, the equivalent or real per capita consumption expenditure is used:

$$e_{h,t} = \frac{y_{h,c,t}}{\pi_{h,c,t}}$$
 avec $\pi_{h,c,t} = \prod_{k=1}^{K} \left(\frac{p_{k,c,t}}{p_{k,c,0}}\right)^{w_{h,c,k}}$ (1)

Where $y_{h,c,t}$ is the total equivalent per capita expenditure of each household h at time t; $\pi_{h,c,t}$ is the household consumption price deflator at time t; $p_{k,c,0}$ is the reference unit price; $p_{k,c,t}$ is the unit price at time t of good k; $w_{h,c,t}$ budget share for good k by household h.

In order to measure the impact of investment in the rice sector in Burkina Faso, the Foster-Greer-Thorbecke (FGT) index family of poverty indices is adopted (Foster et al., 1984). In this case, z is the real poverty line, which is a poverty line measured in reference prices Pr. The FGT family is thus defined as follows:

$$P_{\alpha}(z) = \frac{1}{N} \sum_{h=1}^{H} \rho_{c,h} n_{c,h} \left(\frac{z - e_{h,t}(Pr, P_{c,s,t}, y_{h,t,c})}{z} \right)_{+}^{\alpha} (2)$$

Where $f_+ = \max(0, f)$, N N is the number of households in the survey, $n_{c,h,t}$ is the size of each household; $\rho_{c,h,t}$ is the weight of each household in the survey sample; α is a parameter that captures the poverty aversion or sensitivity of the poverty index distribution. The FGT index measure of poverty depends on the value taken by α . The calculated poverty rate for $\alpha=0$. When $\alpha=1$ the level of poverty is deep. Lastly, when $\alpha=2$, we obtain a severe level of poverty. The potential effect of the growth of the rice sector on poverty could be calculated using the following equation:

$$\Delta P_{\alpha}(z) = \frac{1}{N} \sum_{h=1}^{H} \rho_{c,h} n_{c,h} \left(\frac{z - e_{h,t}(Pr, P_{c,s,t}, y_{h,t,c})}{z} \right)_{+}^{\alpha} - \frac{1}{N} \sum_{h=1}^{H} \rho_{c,h} n_{c,h} \left(\frac{z - e_{h,0}(Pr, P_{c,s,0}, y_{h,c,0})}{z} \right)_{+}^{\alpha}$$
(3)

The magnitude of change in poverty calculated by $\Delta P_{\alpha}(z)$ likely varies with the choice of poverty line and the parameter α .

<u>Data</u>

As aforementioned, the database used for the CGE model is a 2018 Social Accounting Matrix (SAM) and is based on the 2013 SAM structure constructed by the Ministry of Agriculture and Water Development (MAAH, 2016). A SAM is a comaprehensive framework that represents all flows recorded within the economy in a given year. In relation to the agricultural SAM, our model is composed of 32 companies including 16 agricultural industries and 35 products including 17 agricultural products. Changes in prices and household consumption expenditures from the Computable General Equilibrium Model (CGE) are used as inputs in the microsimulation model. In other words, the average change in consumption expenditures of the representative CGE model household is used to update household consumption expenditures from the 2018 Continuous Multi-Sector Survey (CMS). To balance the agricultural SAM data and the household survey data, the Social Accounting Matrix for the year 2018 is combined with the 2018 Employment Resource Table (ERT) data.

SAM flows are valued at producer prices in the activity account and ,market prices (including indirect taxes on products and transaction costs) in the product account. Similarly, there is a distinction between domestic production for domestic consumption and export supply, as own-account consumption is valued at producer prices while exported products are valued at market prices. Households are treated in the SAM as institutional units, consumers, and those with factors of production. The government account is linked to four tax collection accounts (production tax, tariff and quota on imports, value added tax, and direct taxes on household and business income).

The baseline agricultural SAM (MAAH, 2016) did not include a detailed representation of the rice value chain. The SAM has three categories of rice-related activities: (i) rainfed rice cultivation, (ii) irrigated rice cultivation, and (iii) rice grain processing sector. Based on the SAM, the share of rice production by smallholders is low, at 0.67% of the total. The final production on the farm is an intermediate consumption in the processing stage. In the processing stage, the intermediate input is combined with value addition (labor input, farm capital, and non-farm capital and other intermediate inputs) to produce the final product. As a result, there are three rice products: (i) rainfed rice, (ii) irrigated rice, and (iii) husked rice. It is worth noting that rural households are the main producers of cash crops, including rice.

As far as the distribution of value addition in the rice sector is concerned, the stakeholders in the rice value chain in Burkina Faso are smallholders, transporters, cooperatives and rice mills. Farmers are mainly involved in rice cultivation, while some cooperatives are involved in the primary processing (bulk sale of husked rice) of rice produced by farmers. The processing units are involved in vertically integrated activities in the rice value chain, including cultivation, primary processing and secondary processing.



REPUBLIC OF BURKINA FASO



Ministry of Agriculture and Irrigation Development Burkina Faso / Ministère de l'Agriculture et des Aménagements Hydro-agricoles Ouagadougou Burkina Faso www.agriculture.gov.bf/accueil E-mail(s): info@gov.bf