Platform for Agricultural Risk Management

Burundi

Agricultural risk assessment study in the Burundi rice value chain

Main Report

January-July 2024

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PLATFORM FOR
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Platform
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Managing risks to improve farmers' livelihoods

Platform
for Agricultural
Risk Management

Burundi

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1_ Executive Summary

The agricultural risk assessment studies on the Burundi rabbit, maize, and rice value chains were conducted for the Government of Burundi by the Platform for Agricultural Risk Management (PARM) through the Ministry of Environment, Agriculture and Livestock (MINEAGRIE) from January to July 2024. The preliminary results of the study were thoroughly discussed and validated in two workshops held in Bujumbura on 23 and 24 May 2024, with the participation of key stakeholders and oversight and support institutions for the three value chains.

The maize and rice sectors in Burundi

In 2024, maize and rice remain the two main cereals grown and consumed in Burundi. Production of these two commodities increased sharply over the past decade, from 125,000 to over 600,000 tons by 2021 for maize, and from 75,000 to over 260,000 tons for rice. This increase in production remarkably contributes to boosting Burundi's food self-sufficiency and diversifying food intake historically dominated by tubers and bananas with less qualitative nutritional content.

Despite their high increase in production, these two sectors face many risks.

Main risks identified

Risk analysis and risk management capacity of actors in Burundi's rice value chain has shown that the sector is particularly vulnerable to four main types of risk:

- **Weather risks:** although Burundi's climate allows for two or even three successive rice-growing seasons, poor rainfall and heavy rainfall during the cropping season often cause frequent and huge damage on the rice fields and hydro-agricultural infrastructure. Faced with such risks, producers are already deploying mitigating strategies and these efforts need to be supported and strengthened to reduce their consistent very high level of vulnerability.

- **Market risks**: as rice production intensifies, the sector's exposure to risks on the market is increasing sharply, both in terms of price volatility and access to inputs. To date, public institutions and private mechanisms for regulating the cereals market are not very effective, as a result, players remain highly vulnerable to intra- and inter-annual price volatility. In addition, the monopoly status of the fertilizer market makes supplying the national market particularly unstable and risky.

- **Phytosanitary risks**: the frequency and intensity of insect invasions tend to increase due to the arrival of new pests imported from Asia with rice stocks for current consumption, and climate change (particularly impacting the Imbo plains). Although chemical control methods are being developed in Burundi, the ability to identify pests, develop prevention, and control methods is limited. The sector remains highly vulnerable to this pressure which is often an added factor to the risks related to the weather.

- **Machinery risks:** at a time when the upstream and downstream of the sector are becoming increasingly mechanized, the stability of the electricity and, for some equipment, access to spare parts and experienced motor mechanics, are causing more frequent and significant losses. To strengthen the value chain, it is essential to reduce the vulnerability to the risks encountered by players who invest in equipment, particularly, machines for fertilizer production and processing of rice and rice by-products (chaff, bran).

The figure below shows in order of priority the risks identified in detail for each player in the sector and the entire value chain.

Rice vulnerability scores

		Input suppliers	Producers	Traders	Processors	Distributors	Value chain	
1	WEATHER	Low rainfall	4,4	9,1	4,3	7,9	4,0	5,9	
2	WEATHER	Excessive rain	4,4	7,3	4,3	7,9	4,0	5,6	
17	MACHINE	Power outage	5,3			7,5	3,3	5,3	
11	MARKET	Drop in prices	7,0	7,6	3,8	4,4	3,8	5,3	
5	PHYTO	Insects		7,6	3,9	6,1	3,5	5,3	
15	PEOPLE	Worker illnesses and accidents	4,2	7,2	4,8	5,5	3,1	4,9	HIGH VULNERABILITY
6	PHYTO	Rice diseases		7,2	3,3	5,3	3,1	4,7	
10	MARKET	Difficulty accessing inputs	5,5	7,2	2,9	4,8	3,0	4,7	
16	MACHINE	Machine breakdown	4,3			4,6		4,4	
12	MARKET	Increase in prices		4,3	3,7	5,6	4,0	4,4	
7	LOGISTICS	Stock infestations		6,2	3,7	4,0	3,3	4,3	
4	WEATHER	Cold snap	3,2	5,7	3,1	4,6	2,9	3,9	
3	WEATHER	Violent storms	3,2	5,7	3,1	4,6	2,9	3,9	SIGNIFICANT VULNERABILITY
14	FINANCIAL	Access to foreign currencies	4,3	3,3	3,6	4,7	2,3	3,7	
8	LOGISTICS	Thefts	3,2	5,3	3,3	3,6	2,8	3,6	
9	LOGISTICS	Transport accident	2,9	3,6	2,9	3,7	2,5	3,1	AVERAGE VULNERABILITY
13	FINANCIAL	Access to financing	3,1	3,9	2,6	3,2	2,5	3,1	
		Average by actor	4,2	6,1	3,5	5,2	3,2		

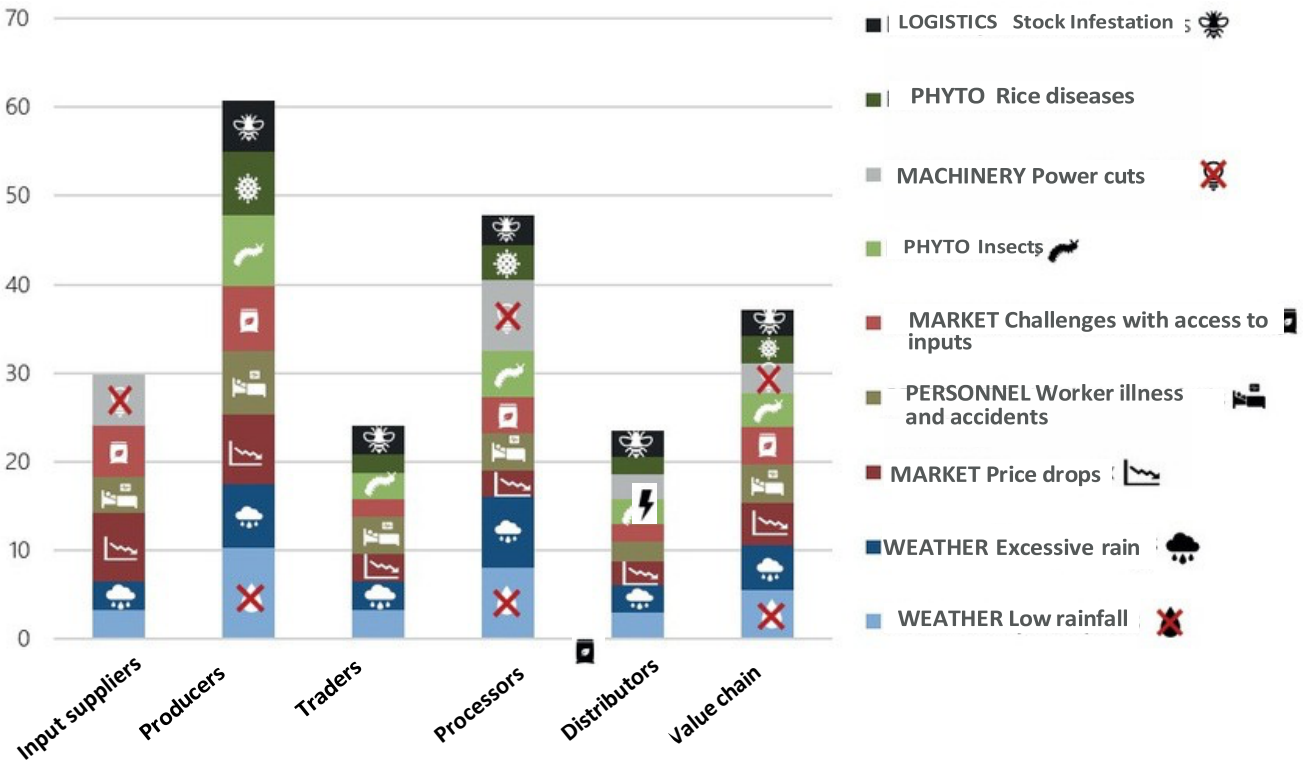


Figure 1: Graphic illustration of the main risks for each stakeholder category

In response to these risks, the study recommends that a risk management programme be put in place targeting 6 major activities, as illustrated below.

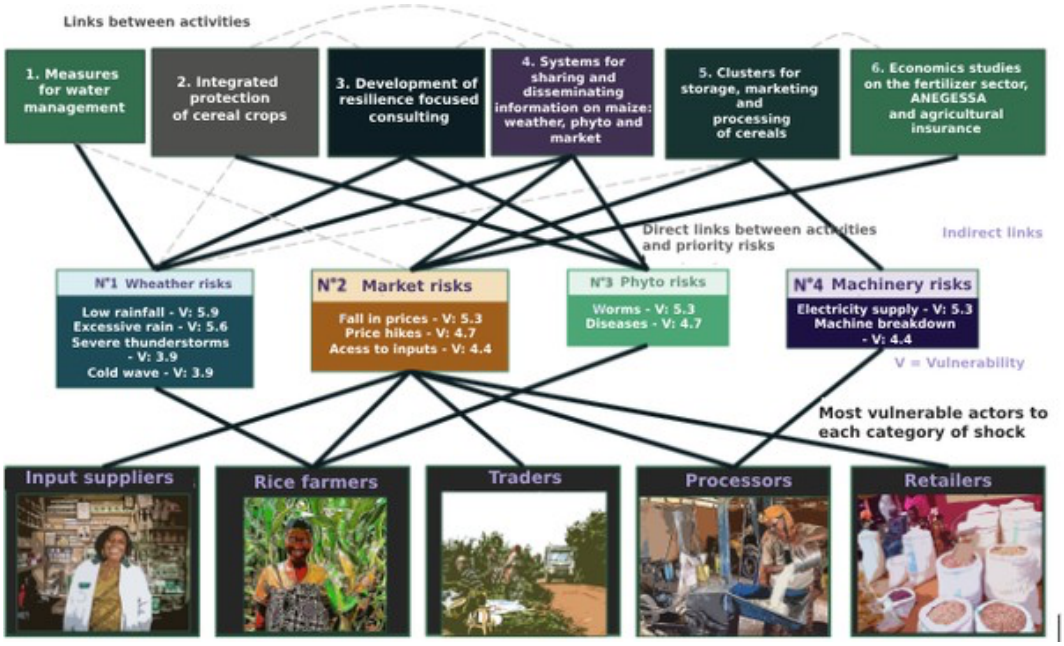


Figure 2: Proposed actions to manage priority agricultural risks in Burundi's rice sector

The six main actions are explained in detail as part of the conclusion of this Report.

1. Improving collective water management
   -at the level of an irrigated area
   - at the level of the landscape
   - at the level of the watershed ;
2. Promote integrated protection to limit phytosanitary risks ;
   - Support producers in implementing preventive pest management (rice growing conditions maintaining ecosystem regulation capacities);
   - Support farmers in curative control ;
   - Promote a landscape approach to health risk management;
4. Strengthen technical advice and support services within the rice value chains by focusing on the resilience of cropping systems.;
5. Enhancing the supply of agricultural, agro-meteorological and commercial information using ICTs ;
6. Promote Burundi's unique model at the international level, while continuing to innovate (active monitoring ; co-constructed research; training);
7. Strengthen cluster effects within the rice value chain.

Three other proposals are added to the main recommendations:

1. Conduct a technical and economic study of the fertilizer sector
2. Better define ANAGESSA's intervention methods and develop a program to strengthen the agency technically and financially in order to achieve a sustainable policy for regulating the volatility of the grain market.
3. Analyze the priorities and economic potential of insurance schemes in rural areas

Following this Report, a mission to design a Risk Management Program for the three targeted value chains must be initiated to propose how these activities should be built, coordinated, implemented and financed.

2_ Background

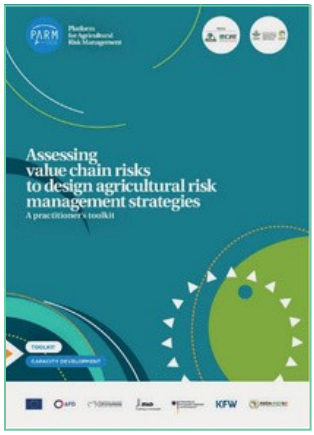
2.1. The Platform for Agricultural Risk Management (PARM)

The Platform for Agricultural Risk Management (PARM) was launched in 2013 and aims to make risk management an integral part of agricultural policy and investment planning in agriculture. PARM is a G20 initiative, hosted and managed by the International Fund for Agricultural Development (IFAD) and financed by a partnership between the European Commission (EC), the French Development Agency (AFD), the Italian Development Cooperation Agency (AICS), IFAD, and the German Development Bank (KWF). (EC), the French Development Agency (AFD), the Italian Development Cooperation Agency (AICS), IFAD and the German Development Bank (KWF). The latter has supported the partnership between PARM and the African Union Development Agency, formerly known as the New Partnership for Africa's Development (NEPAD) since PARM phase 1.

The Platform promotes the application of a rigorous and comprehensive approach to agricultural risk assessment and management in developing countries. It provides factual risk data and tools for agricultural risk management.

It also facilitates dialogue between Public Authorities and Stakeholders with a view to:

- mainstreaming agricultural risk management into agricultural policies and practices;
- stimulating investment in agriculture



2.2. Study Objectives

This assessment should help to identify, quantify and prioritize agricultural risks and identify appropriate risk management tools, conceptualize a Project/Programme on Agricultural Risk Management (ARM) and support National Authorities in the implementation of risk management tools in Burundi.

It deploys the PARM methodology defined in a practical guide: *Assessing value chain risks to design agricultural risk management strategies.*

An initial Report ended the **start-up phase, targeting the main risks in the three value chains** designated by the government, including rice, maize and rabbits. *[1]*

2) This Report was followed by a **phase involving the study of agricultural risks** across the three targeted value chains that should lead to the establishment of a risk-scoring grid;

3) Similarly, **a study of vulnerability to agricultural risks** will be carried out, listing the agricultural risk management tools, mechanisms and skills already implemented and/or planned in Burundi in the pre-targeted agricultural value chains;

4) Following these risk and vulnerability analyses, a risk map will be drawn up, making it possible to prioritize the most vulnerable risks. This prioritization will then be presented, discussed and adapted with the Burundian Government, culminating in the drawing up of an action plan to implement agricultural risk management tools and policies.

5) The fifth and final stage will be to draw up an action plan for the implementation of agricultural risk management tools and policies in Burundi, covering the three targeted value chains and the risks with the highest vulnerability rates. It will be presented and validated at a Workshop.

Details of the study methodology are provided in the Appendix.

1 [1]Rice and maize are two commodities already targeted by COMPACT Burundi for food and agriculture, alongside pigs and poultry. Targets in terms of production scores, exportable surpluses, potential revenues generated and jobs created have been defined in this document. Rabbits, on the other hand, are an emerging priority for the President of the Republic, and have attracted the attention of MINEAGRIE, which ranks this sector on the same level as poultry and pigs.

2.3. Overall Context of the Burundian Economy

Some economic indicators of Burundi (2022 - World Bank)

Population: 13.2 million
Population density: 489 h/km²
GDP: current USD 3.34 Billion
GDP per capita: current USD 259
Growth 2022 :1.8%
Inflation: 18.8%
HDI rank: 187/191 (UNDP)
GINI Index: 38.6
Poverty (USD 2.15 PPP): 70.4%

Burundi is a **low-income country**, and in 2022, according to the World Bank, was the country with the lowest GDP per capita in the world, at USD 259/year (current USD 2022) *[2]*.

It is also the second country with **the lowest urbanization rate** on the planet at 14%, one of **the highest contributions of agriculture to GDP** (28%) and one of the lowest contributions of International Trade to GDP (28%) *[1]*.

With a **food self-sufficiency rate of over 99%** *[3]* in 2020-21, Burundi, and more specifically the Burundian agricultural sector, can be described as not mainstreamed into **International Trade**, but also very little dependent on the latter.

However, this analysis needs to be qualified for several reasons:

1. Burundi was one of the most **densely populated** countries in the pre-industrial world. Its relatively intensive traditional agriculture and dynamic rural economy have always been geared towards a large domestic market. This economic model and social structure are difficult to grasp using the measurement indicators of conventional macroeconomics, which mainly account for wealth at the level of companies (GDP per production), trade (GDP per trade) or households (GDP per consumption). In the context of the Burundian economy, the majority of households and businesses are the same economic units, and their trade, although intense *[4]*, is difficult to measure because they are widely dispersed, informal and partly non-monetary.

2. The ability of Burundian farms to combine **multiple crops on a single piece of land** and, at the same time, to **keep growing different crops together** over a year in virtually continuous value-added land makes measuring productivity on the scale of a single crop, and hence the production of agricultural statistics, a **highly complex** task**.** Our discussions with agricultural technicians confirmed this difficulty and the tendency for public statistics to consider only the main crop of multi-cropping farms *[5]*. The same applies to changes in crop rotation marked by an interruption (dry season, land fallowing), whereas many crop rotations are intermingled and follow one another without any real interruption.

3. The Burundian Government's capacity to gather information on production, artisanal processing (also very dense and intense) and informal flows seems limited in this context where commercial bottlenecks (port, central markets, border posts, large factories) concentrate on a marginal share of trade. Public statistics systems therefore seem to have difficulty in capturing part of the economic activity *[6]* and agricultural, livestock, forestry and rural crafts production are likely undervalued in GDP calculations.

A https://thedocs.worldbank.org/en/doc/b3502c65235d8c72aef5f34d87ed6298-0500062021/related/data-bdi.pdf

2 https://data.worldbank.org/

3 https://www.afdb.org/fr/documents/rapport-danalyse-des-bilans-alimentaires-du-burundi-2020-2021

4 It should be noted that many studies and works that describe Burundian agriculture as not very productive, or even "archaic", seem to be seriously lacking in field data collection and visual and qualitative comparisons with other developing country contexts, and with agricultural economics in general.

5 The ENAB methodology specifies that when there is multiple cropping, a maximum of one main crop and two secondary crops are taken into account. During our field visits, we saw multi-cropping systems involving up to six crops on the same piece of land.

6 This is explicitly recognized in the surveys of informal cross-border trade carried out by the BRB with technical support from ISTEEBU: https://www.brb.bi/sites/default/files/Rapport_enquete_commerce_informel%202018.pdf

In this particular economic context, woven around a densely populated rural environment, rather than around cities like in most of the world's economies, the **mainstreaming of imported technological innovations in agriculture** (selected seeds, mineral fertilizers, etc.) and f**ood-processing units** (small mills, rice hullers, electric motor presses, etc.) has resulted in a **high accelerated economic growth** in recent years.

This acceleration, based on the development of international trade, is a marked improvement in the GDP trends, with strong growth in agriculture and services (notably trade and credit).

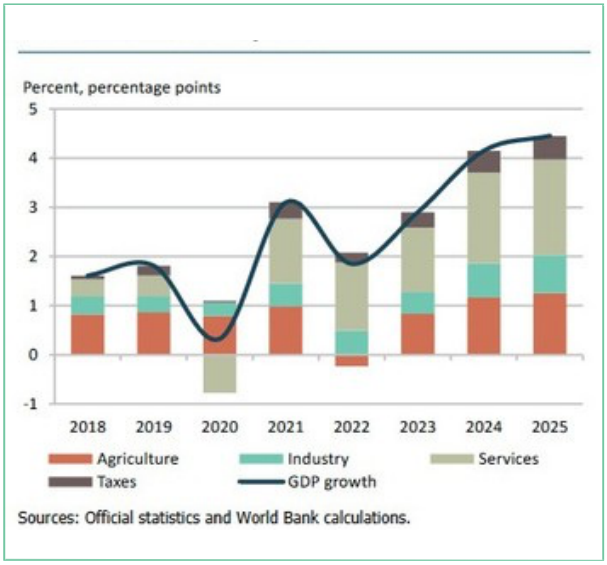


Figure 3: Structure of GDP growth by sector – World Bank Analysis

The **rate of use of mineral fertilizers and improved seeds** has risen sharply in recent years, thanks to inputs subsidy programmes (PNSEB and PNSS) and the distribution of inputs provided by various TFPs. The inputs subsidy programmes (PNSEB and PNSS) increased from 15.8% *[7]* in 2018 to 38.1% *[8]* in 2020 and probably over 50% of farms in 2024 *[9]*; the inputs provided by various TFPs increased from 2.2% in 2018 to 7% in 2020 and probably over 20% in 2024 *[6]*. **Organic fertilization**, with crop residues and animal manure, is practically widespread, with 60% of use in 2018, 72% in 2020 and probably over 80% in 2024. The use of **phytosanitary products** is also on the rise, rising from 7.3% in 2018 to 12.9% in 2020 and probably over 20% in 2024.

In addition, **income diversification** is relatively high. 68.5% of crop farmers were also livestock farmers (owning at least one type of animal) in 2018 (ENAB).

Moreover, in many rural households, **men sell their labour** to wealthier crop farmers and livestock farmers, and work part of the year in transport services, fodder supply, handling, small-scale processing, construction, livestock farming and trading *[10]*, while women work on the family farms, unpaid, for the majority of their time *[11]*.

In conclusion, it is worth noting that the **penetration of microfinance and banking in rural areas** is **accelerating** significantly and has led to a remarkable increase in the amount of credit granted to agriculture in recent years. However, the recent acceleration in credit and investment levels in agriculture seems to be accompanied by a sharp rise in the balance of payments deficit. The country's major crisis due to lack of foreign currency is one of the main difficulties currently weigh heavily on the Burundian economy. During the study, the official EUR-BIF exchange rate was EUR 1 for BIF 3,075, but the black-market exchange rate (used by the majority of economic players) was 1EUR for BIF 5,150. This represents a **difference from the official exchange rate of over 67%.**

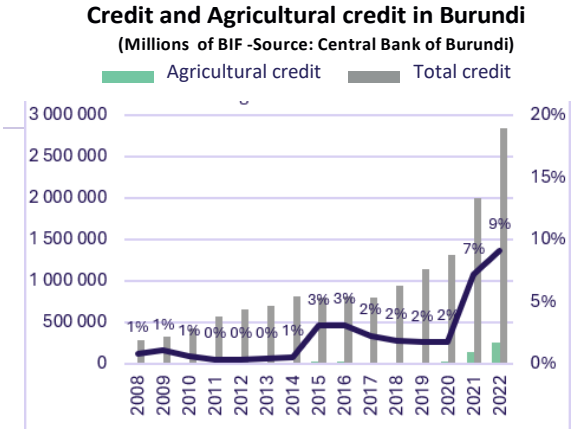


Figure 4: Trend in credit amounts and the share of credit allocated to the agricultural sector

7 ENAB 2017-2018

8 https://www.worldbank.org/en/country/burundi/overview

8 ENAB 2019-2020

9 Estimate based on our interviews and surveys

10 https://www.resilience-burundi.org/wp-content/uploads/2023/01/Brochure-resilience-Diversif-03.pdf et http://www.tropicultura.org/text/v14n1/17.pdf

11 Burundi Poverty Assessment 2016, World Bank, ENAB data for the 2012-2013 period

This observation is confirmed by an IFC Report, which underscores that this is one of the strongest macroeconomic constraints to private sector growth and trade in the country *[12]*.

2.4. General Context of Burundian Agriculture

Thanks to a **diversity of agro-climatic gradients** based on altitude and high rainfall patterns due to its proximity to the Equator, Burundi's agriculture is extremely diversified.

Tubers, bananas (three species), protein crops*[13]* **and cereals dominate crop rotations.** Crop rotations are supplemented by a wide variety of fruits and vegetables, trees (for fertilizer, fuel wood and food), and strong use of forage plants to feed a large herd of ruminants (with a predominance of fodder supply).

Some Agricultural Indicators for Burundi

National Average Rainfall (mm - CHRIPS 81-23):
Min: 972 (2005), **Avg: 1224**, Max: 1499 (2018)
Number of dry season months (<50 mm-CHRIPS 80-23):
Min: 3, **Avg: 4**, Max: 5
Land use (million Ha- FAOSTAT 2022):
Agri: 1.6 (58% of the country)
Grassland/Pastures: 0.5; Forest: 0.3; Others: 0.3
Crop rotation Useful agricultural area (million ha - FAO 2022):
Protein crops: 0.8 (53%)
Tuber crops: 0.4 (26%)
Cereals: 0.3 (20%)

Except for bananas, taro and goosegrass, all food crops have shown very high growth in recent decades. This reflects changes in consumption habits, with an increase in cereal consumption (maize, rice) to the detriment of bananas in particular.

However, two traditional cash crop and export crop sectors, **coffee and cotton**, **show a structural decline in production** due to low comparative profitability for farmers compared with crops that are meant for local and sub-regional markets. The third traditional export sector, **tea**, is **withstanding rather well** and growing steadily, probably as a result of further easing of restrictions.

Banana beer exports, the country's flagship product, have increased significantly in recent years. In this fully liberalized sector, a multitude of small-scale and semi-industrial companies are expanding on the national and sub-regional markets.

[12] https://www.ifc.org/content/dam/ifc/doc/mgrt/cpsd-burundi-fr.pdf
[13] In particular the 2 bean species *Vigna* sp and *Phaseolus* sp.

	1961	1971	1981	1991	2001	2011	2021	1961-2021	2011-2021
Cassava	370	378	451	584	717	509	2732	2362	2223
Banana	1000	1223	1239	1586	1549	1849	1301	301	-547
Sweet potatoes	380	390	497	681	781	955	1113	733	158
Dried beans	230	285	294	338	249	201	633	403	432
Maize	95	133	146	172	124	128	610	515	482
Other fresh vegetables	102	120	160	220	250	435	*485*	383	50
Potatoes	30	35	36	46	27	28	39	364	366
Rice	3	4	10	40	61	91	4	256	168
Sugar cane	0	5	6	132	124	204	*220551*	201	-3
Other fruits	37	53	69	88	85	116	*19931*	94	15
Taro	95	98	100	132	85	58	52	-43	-6
Palm kernel	6	12	12	15	10	70	*89*	83	19
Tea (leaf)	0	0	2	23	44	41	*50*	50	10
Sorghum	20	20	53	65	69	87	42	22	-45
Soybeans	1	1	1	1	1	3	18	18	16
Coffee, green	14	25	44	34	71	42	*17*	3	-25
Dry peas	29	31	30	37	33	31	*13*	-16	-19
Millet	8	9	11	13	10	10	*11*	3	1
Wheat	4	5	7	9	9	10	9	5	-1
Elusine	0	0	0	0	11	11	6	6	-5
Pigeon pea, dry	2	2	2	3	2	6	3	1	-3
Cotton seed	9	9	7	7	3	3	*2*	-8	-1
Yams	6	6	6	8	10	10	1	-5	-9
Raw tobacco	1	1	3	4	1	1	*1*	1	0

Figure 5: Trends in Burundi's main agricultural produce from 1961 to 2021 (sources: FAOSTAT and INSBU)

The rainfall distribution over 8 to 10 months, depending on the rice-growing zone, enables most farmers to grow rice **at least in two cropping cycles** back-to-back, which they supplement with small-scale off-season crops on the sandbank of lowlands and along rivers during the dry season. The Ministry of the Environment, Agriculture and Livestock (MINEAGRIE) considers three agricultural seasons per year:

-Season A: from September (or in some particular instances early October in the event of late rains) to late January or early February, depending on the length of the crop cycles.

-**Season B**: from the peak of the rainy season, in February or early March at the latest, to early June or even late June, depending on the length of the crop cycles

-Season C: off-season from mid-June to early July, ending in September. This season is only practiced in irrigated areas (by gravity or manual water transport) and therefore generally concerns smaller average areas per farm.

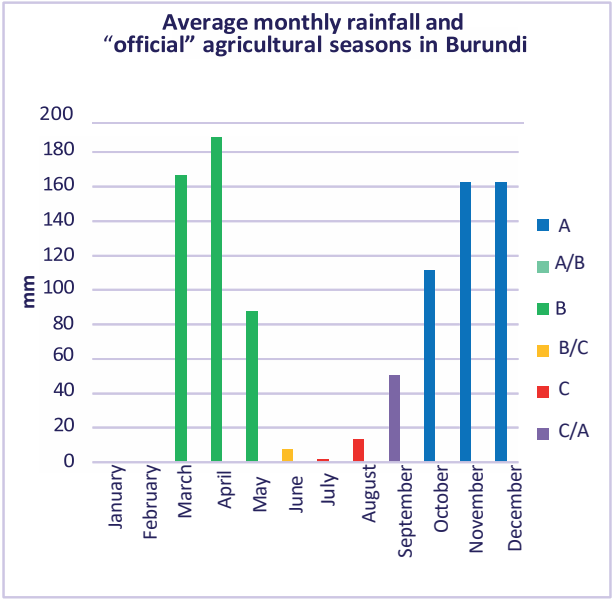


Figure 6: Average rainfall distribution, monthly average 1981-2023 (Source: CRIPS)

In practice, **many crops are planted together and grow one after another according to much more complex farming schedules** that are appropriate to the work capacity, exposure and slope of the farms.

Some crops, such as bananas, cassava and palm oil, are harvested virtually all year round. In irrigated rice-growing areas, many producers stagger their cropping cycles, with harvests spread over more than 4 months a year.

Overall, **food availability and the marketing of agricultural surpluses are subject to moderate seasonality,** less marked than in countries with long dry seasons and more homogeneous topography.

The "**lean season**", i.e. the period in the year when food availability is on average more limited, while agricultural work (and thus farmers' energy needs) is intense, is between **November and mid-February**, before the start of Season A harvests.

As can be seen below (Figure 7), Burundi's agrarian trajectory is tending towards an increase in agricultural acreage, to the detriment of grazing land (and lowland wetlands). The Burundian Government's decision **to ban grazing of wandering livestock** *[14]* in 2018, but whose implementation was postponed until October 2021, is causing a sharp acceleration in this trend, with **animals virtually disappearing from the landscape.**

After declining sharply in the 1980s, 1990s and 2000s, the woodland area has been increasing nationwide since 2010, mainly due to the expansion in artificial afforestation and agroforestry *[15]*. In a country with a long history of deforestation, high demand for wood for construction and fuel wood seems to have sparked renewed interest over the past 10 years in very small-scale forestry (areas of just a few hundred square meters planted with trees), and more particularly in agroforestry *[16]*.

Agroforestry plays a strategic agronomic role in soil stabilization, vertical fertility enhancement and fodder production (notably Grevillea *[17]*) in most cropping systems.

[14] https://mineagrie.gov.bi/mineagrie/uploads/decret_loi/64ab5cd6b293dtmp
[15] https://www.cbd.int/doc/world/bi/bi-nbsap-v2-p1-fr.pdf
[16] https://hal.science/hal-03425303/document
[17] https://www.agter.org/bdf/fr/corpus_chemin/fiche-chemin-235.html

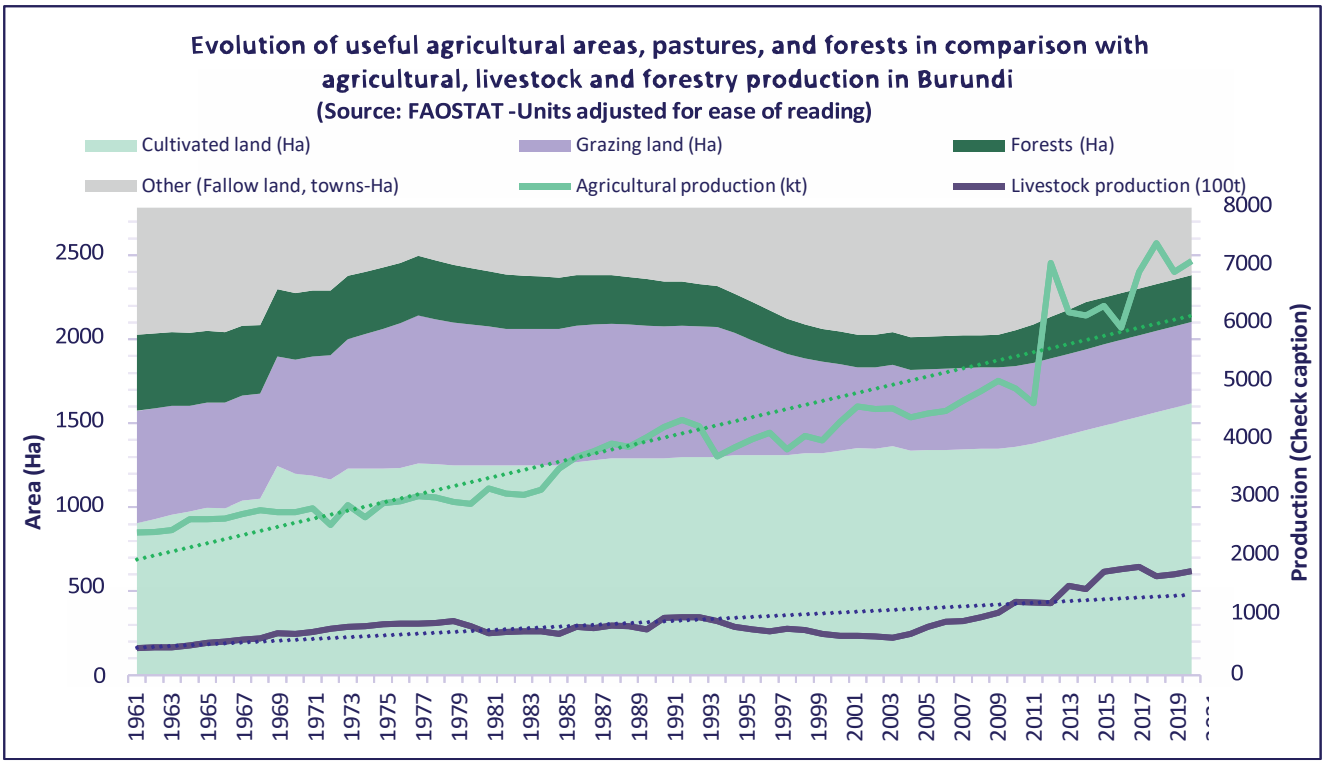


Figure 7: Trends in mainland uses and crop and livestock farming

As can also be seen, crop and livestock farming are increasing faster than the available arable land, and despite the historically labor-intensive and highly fragmented agriculture, Burundi continues to witness a steady and rapid increase in both agricultural and zootechnic yields. The average yield per hectare for all crops combined increased from 2.7 to 4.4 tons of agricultural produce per hectare between 1961 and 2022, according to FAOSTAT. Livestock production from 65 kg/ha/year to 368 kg/ha/year over the same period.

The three sectors targeted by the Burundian Government for the study of agricultural risks are emblematic of this agricultural intensification in Burundi.

The maize sector is probably the sector that has been recording the highest level of increase in yields in recent years (2020-2024), due to the rapid increase in the use of improved seeds (especially hybrids) and combined mineral and organic fertilizers. Although a recent appraisal of agricultural production is not available, the latest data from the National Agricultural Survey (ENAB) indicate that production has more than doubled between 2019 and 2021, increasing from 270,000 to 610,000 tons.

The rice sector has seen the highest increase in cultivated acreage thanks to the construction of major hydro-agricultural schemes in the "Marais" - "Marshy areas" (wetlands inside the lowland within hilly areas) and the Imbo lowland. These agricultural development facilities result from several major rural development programs, notably the programs financed by IFAD, which have enabled the development of 16,714 ha*[18]* of marshland in irrigated zones, out of the national potential of 123,317 ha*[19]* identified by MINEAGRIE.

The rabbit sector, identified by the President of the Republic in 2023 as a strategic sector, is emblematic of the spread and intensification of small-scale livestock farming in rural areas where the economic value of manure is almost as high as that of rabbit meat because certain biomasses are used to process the manure into more appropriate concentrated organic inputs for the precision manual farming practiced on the farms.

[18] https://www.ifad.org/documents/38714182/43045086/burundi_workshop_report.pdf/a653456e-2150-ef43-6d66-0543a527e807
[19] https://www.atlasdesmarais-bdi.org/bur/doc/marais/Atlas_v1_251017.pdf

3_The Rice Value Chain in Burundi

3.1. Reminders on the Characteristics of rice

Rice cultivation is said to have begun over 10,000 years ago in the Yangtze River Delta Region of China, as well as in India and Thailand. The early farmers began to grow wild rice, a semi-aquatic plant that grew naturally in wetlands. Over time, rice cultivation spread throughout Asia, adapting to different climates and environments. Wild rice has also been domesticated on the African and American continents, independently of Asian rice.

Sophisticated irrigation systems have been developed to provide the water needed for growing this crop. Rice is a semi-aquatic plant that needs a lot of water for its cultivation. It is often grown in areas where water can be controlled, such as developed lowlands and irrigated areas. Also growing rice requires a lot of nutrients (nitrogen, phosphorus, potassium, etc.) and therefore needs good fertilization. Its growth cycle lasts between 90 and 210 days, it enables up to three cropping cycles per year in some areas.

Concerning the environment, irrigated rice-growing systems have the disadvantage of producing large quantities of methane. Management of water resources, in terms of availability and leaching, is also an issue. To address these challenges and also to increase yields, the *International Rice Research Institute* (IRRI) is promoting the System of Rice Intensification (SRI), an optimized technical itinerary for irrigated rice production that includes the promotion of nursery & transplanting techniques, alternating flooding and drying, etc.

Harvested rice is called **paddy rice**: the albumen is still clothed in the husk and bran. The first step after threshing, which separates the grains from the ear, is in principle sifting and winnowing to remove impurities. The next step is husking which consists in separating **the husk** from the grain, the husk consists of 20 to 25% of the weight of the paddy rice: the rest is **cargo rice**. The cargo rice is then milled by polishing to remove the brown husk, **the bran**, and the germ (about 10% of the paddy's weight). Once the broken rice from the milling process has been removed, the final result is between **50% and 65% white rice.**

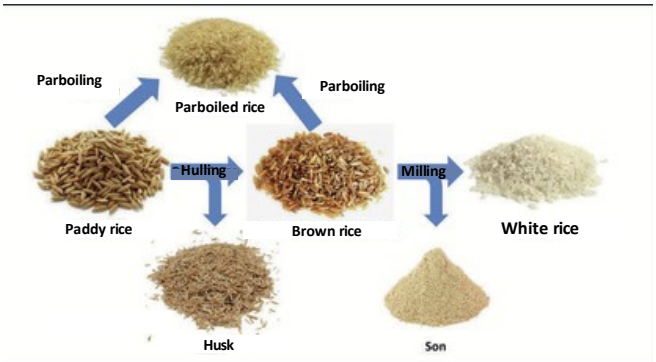


Figure 8: Different types of rice and production processes (source: GOYON 2017)

Over the past few decades, global rice **production** has followed a **generally upward trend** and is expected to exceed **800 million tons of paddy rice per year** by 2024*[20]*. 90 percent of rice production still comes from Asia, led by China, India, Indonesia, Bangladesh, Vietnam and Thailand. Rice is a staple food for half the world's population, especially in the major rice-producing countries. In 2021, international trade accounted for 6.6% of world production (by volume) *[21]*.

[20] 529 Million tons of white rice according to the latest AMIS estimations: https://www.amis-outlook.org/amis-monitoring

[21] https://olivierfrey.com/agridata-18-evol-production-commercialisation-riz/

Despite significant rice production (in Nigeria & Mali in particular), Africa accounts for only 3.8% of global rice production *[22]*. Africa is a major rice importer, and rice consumption is increasing rapidly, particularly in the cities of sub-Saharan Africa.

3.2. Rice in the Community of East African States (CAE)

Rice production in the EAC has doubled since early 2010 and now stands at around **7 million tons**. This increase in rice production, which is more rapid than population growth, is driven by Tanzania, which produces between 60% and 65% of the sub-region's volumes (approx. 3.9 million tons per year). Over the same period, rice production increased even faster in the Democratic Republic of Congo, and more recently in Uganda.

Tanzania exports around 10% of its rice production to other countries in the sub-region, particularly Uganda, Rwanda, Kenya and, to a lesser extent, Burundi (3,000 to 18,000 tons per year). Burundi does not export rice (except for small informal rice flows to Congo in the Cibitoke Province) *[23]*.

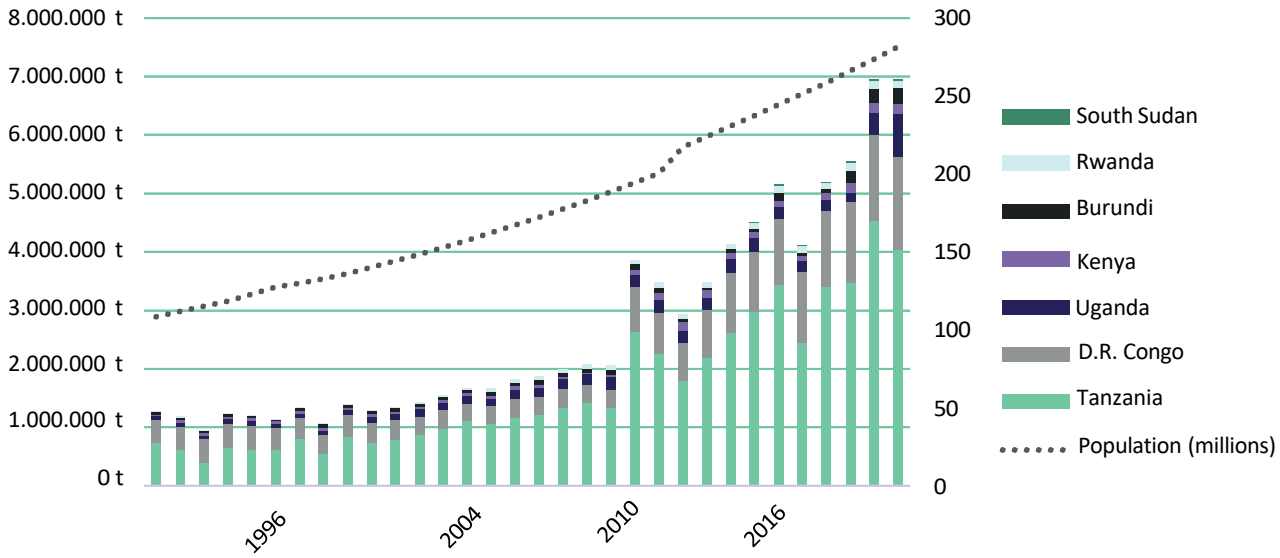


Figure 9: Rice Production (tons) and Population Trends in the CAE Sub-region (Source: ENAB 2012-2021 for Burundi, FAOSTAT for other data)

3.3. Rice in Burundi

3.3.1. Production, Imports and Outlets

Rice is a crop that is cultivated in its natural environment such as low-lying areas. It was **introduced in the 1890s** into the **Imbo Plains**, specifically at Rumonge *[24]*, by the population of Asian origin from Tanzania. In 1960, irrigated rice cultivation was introduced with the support of the Fonds Européen de développement de l'Imbo (European Imbo Development Fund) (FED-Imbo), which became the Société Régionale de Développement de l'Imbo (SRDI) (Imbo Regional Development Company) with a mission to develop rice cultivation through all the links in the value chain.

The extension of rice cultivation to marshlands at altitudes above 1,300 m will be brought to a standstill for a long time by the sterility of spikelets due to low night-time temperatures, with vegetative activity interrupted at 13 °C. The encouraging tests carried out by the Institute of Agronomic Sciences of Burundi (ISABU) in 1977 and the Varietal Improvement Project for rice cultivation on highland marshlands carried out by the Faculty of Agronomic Sciences (FACAGRO),

[22] Source : FAOSTAT
[23] https://www.brb.bi/sites/default/files/Rapport_enquete_commerce_informel%202018.pdf
[24] http://www.capad.info/spip.php?article144

now known as the Faculty of Agronomy and Bio-Engineering (FABI) of the University of Burundi have enabled the **development of hydromorphic marshlands** in Seasons A and B *[25]* through the cultivation of upland rice on marshlands **starting from 1982**.

There are currently **three types of rice cultivation**:

(i) irrigated rice cultivation on plains and high-altitude marshlands,
(ii) flooded rice cultivation in undeveloped marshlands,
(iii) rain-fed rice cultivation on small lowlands and hillside valleys.

Types of rice cultivation in Burundi

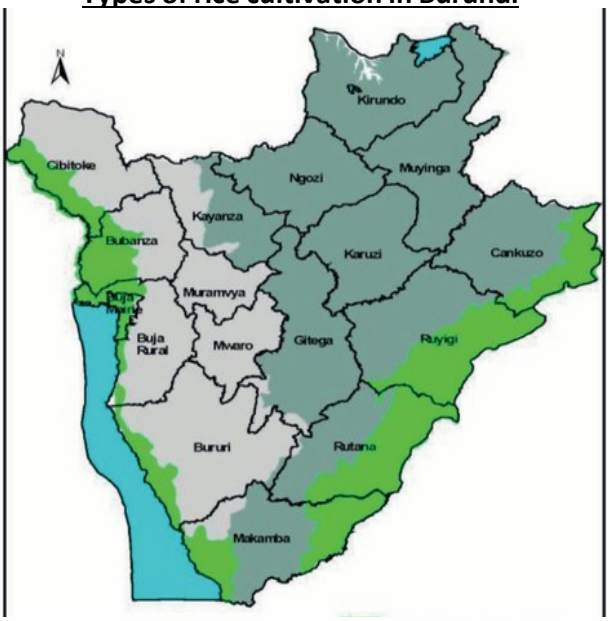


Figure 10: Types of Rice Cultivation in Burundi (Source: CAPAD 2018).

Irrigated rice cultivation ranks the highest in terms of productivity, cultivated area *[26]*, and yields in paddy tonnage. Yields vary between 3 and 6 tons of paddy/ha/season, depending on the varieties used and the cultivation techniques employed (SRI or SRA *[27]*). According to the SNDR-B, out of the 84,526 ha under rice cultivation, 64.41% of the cultivated land relates to high-altitude marshlands which occupy 54,448 ha, of which 12,083 ha have already been developed, 8,925 ha are under study and 33,440 ha of marshlands remain to be developed in the future. Rice cultivation on developed plains covers 27,265 ha of which 11,279 ha are developed, and 15,986 ha are under study. Rain-fed rice cultivation has the lowest yields in terms of productivity (1-2 tons of paddy/ha) and cultivated area (2,814 ha).

National rice production has increased sharply to almost 260,000 tons for the 2020-21 season. There are virtually no formal rice exports, and rice imports from Tanzania are limited.

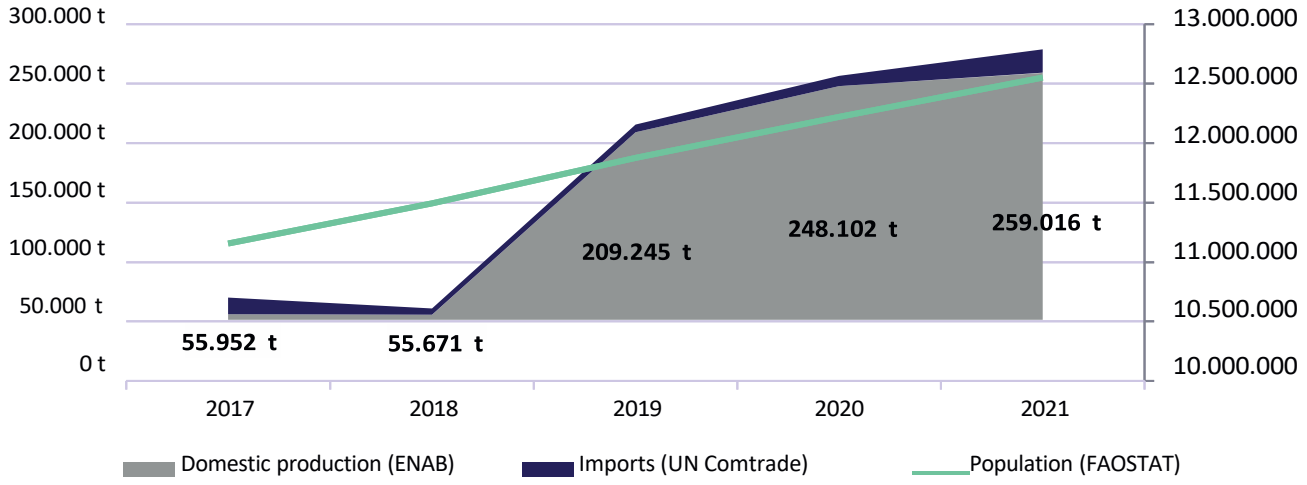


Figure 11: National production and import of rice, in volume (tons) (sources: ENAB and UN Comtrade)

[25] Before the introduction of rice cultivation in the high marshlands, these marshlands were areas where farming was carried out only during Season C or the Marshlands Season to grow maize, potato and market garden crops. During the rest of the year, these marshlands were not cultivated. Only rice, a hydrophilic crop, can tolerate hydromorphic marshlands, which were developed and used from November (establishment of flower beds, nursery beds) to May-June (harvest).

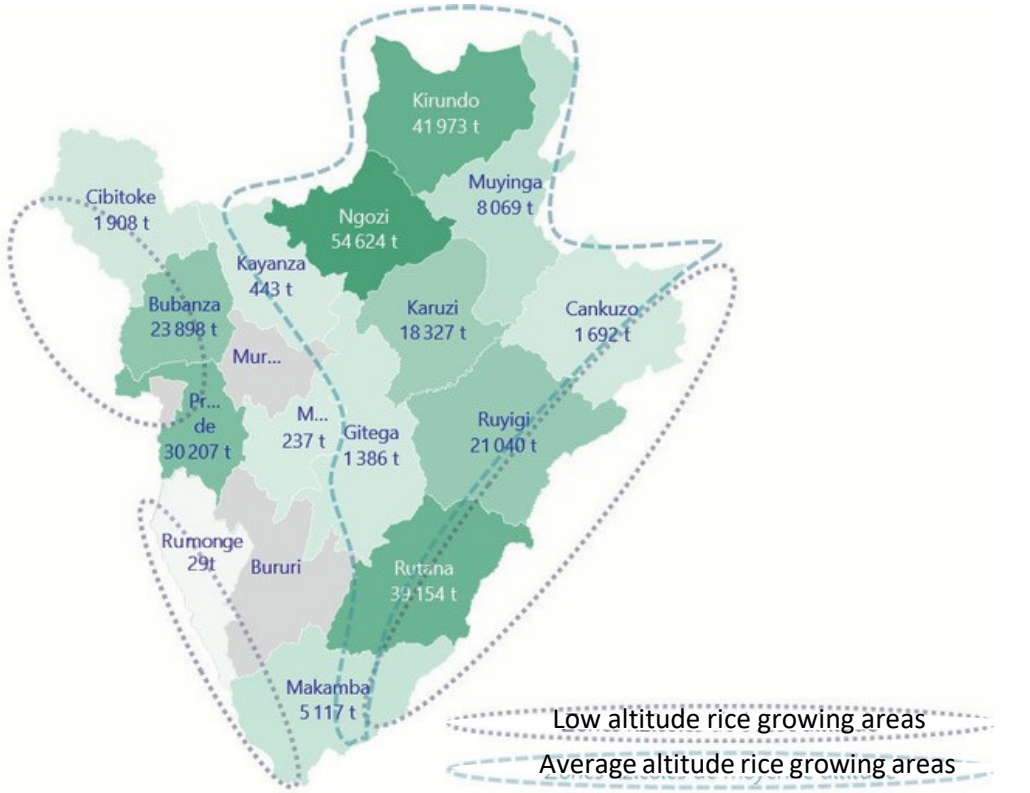
[26] Rice cultivation on high-altitude marshlands is prone to low night-time temperatures below 13 °C, which leads to sterility of spikelets.

[27] The intensive rice-growing system (SRI) is difficult to apply because not all the conditions are always favourable for its adoption (limited access to water, poor development of the land and levelling). The players involved in rice-growing development have joined forces to produce a harmonized sheet on the improved rice-growing system (SRA).

Rice production **increased spectacularly between 2018 and 2019 (+276%)** and has continued to increase ever since (+24% in two seasons). Over the period 2016-21, **IFAD's sector development program (PRODEFI)***[28]* carried out the development of 7,619 hectares of marshland by providing hydro-agricultural structures. ENABEL, through its Institutional and Operational Support for the Agricultural Sector program (PAIOSA), has also enabled the development of 3,200 hectares over the same period. Other Technical and Financial Partners have contributed to the construction of this type of structure. Thanks to these programmes, Burundi's rice-growing industry, previously dependent on periods when water level drops (in Seasons B and C), now benefits from controlled irrigation, enabling it to launch a rice-growing cycle as early as Season A (55,000 t harvested in 2019-20, as against 7,000 t in 2017-18*[29]*) while increasing the Season B production cycle (173,000 t harvested in 2019-20, as against 27,000 t in 2017-18).

The programme has also led to the dissemination of improved technical itineraries such as SRI and SRA, resulting in higher yields, the structuring of the downstream sector (94 Rice Cooperatives, construction or rehabilitation of infrastructure such as secondary roads or storage sheds, processing equipment).

Rice Production for the 2019-20 Season: 248,000 Tons



***Season A**: harvest in February, approx. 55,000 t (22% annual production)*

***Season B**: May-June harvest, approx. 173,000 t (70% annual production)*

***Season C**: approx. 20,000 t (8% annual production)*

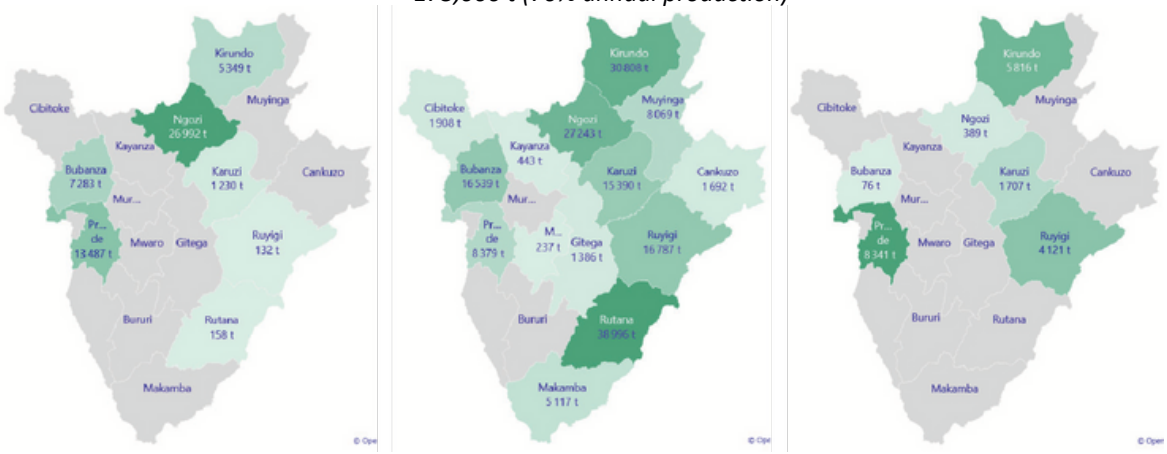


Figure 12: Annual Rice Production by Province, 2019-20 Season (Source: ENAB)

[28] https://programfidaburundi.org/index.php/savoirs/287-augmentation-de-la-production-vivriere-et-laitiere

[29] Source: ENAB

For the 2019-20 Season *[30]*, concerning the **spatial distribution of rice production**:

The two Provinces with the highest production volumes, **Ngozi (55,000 t** in 2019-20) and **Kirundo (42,000 t)**, located in the North of the country, have the advantage of being able to undertake two to three cycles of rice production during the year.

- Since 2018, rice production has increased 9-fold in Kirundo (4,600 t in 2017-18) and 4-fold in Ngozi (12,400 t in 2017-18).
- They account for 39% of national production in 2019-20.

- **Rutana** Province (**39,000 t**, representing 16% of national production) ranks third. In this Province, there is a concentration of cropping cycle in Season B. The dramatic increase in rice cultivation is spectacular in this Province which produced only between 400 and 600 t before 2018.
- The Imbo Plains, including the **Bubanza and Bujumbura rural** Provinces, account for 22% of national rice production, with two cropping cycles in Seasons A and B. These Provinces are also witnessing extremely impressive increases in rice production, from less than 1,000 t in 2016-17 to 4,600 t in 2017-18 and **54,000 t** in 2019-20.
- **Karuzi** Province is also steadily increasing its rice production: from 1,350 t in 2017-18 to 18,300 t in 2019-20, i.e., +1260%.

In terms of outlets, **white rice is intended for human consumption. Rice bran** is used as an intermediary ingredient in the manufacture of animal **feed**. Despite its high calorific content, the **value and use of rice husk are low**: farmers use it as stable bedding, while some entrepreneurs use it to make fuel briquettes used in particular for firing mud bricks and roof tiles.

Official production data, once corrected for stock variations carried out by institutions in charge of food security *[31]*, provide an **available annual ration of 65 kg of cereals per capita, including 20.5 kg of rice (32%)**. Rice is the second most consumed cereal after maize (34 Kg per capita, 52%), although tubers remain the population's primary source of energy (39% of calorie intake). The increase in rice (and maize) production has enabled the country to improve its **food self-sufficiency rate for cereals from 77.4% in 2020 to 114% in 2021***[32]*.

Consequently, all the increase in production seems to have been absorbed by national consumption, and probably also by informal cross-border flows, leading to an improvement and diversification of nutritional intake in rural areas, and a fall in rice prices (after adjusting for inflation) in urban areas, as described below.

[30] Sources: ENAB 2017-18 and ENAB 2019-20

[31] ANAGESSA, WFP.

3.3.2. Rice prices in Burundi

In addition to **seasonal variations in supply**, price trends for rice (grain) are influenced by **local demand** (in the hills and townships where most of the produce is sold) and by the national market, and also by **fluctuation trends in the sub-region** (demand from neighbouring countries) and **internationally** (changes in world prices and the exchange rate of the Burundian Franc). It is impacted by inflation, notably on transport costs and this factor feeds into inflation on foodstuffs.

Monthly price trends in Burundi's retail markets bring to the fore **a regular but variable seasonal pattern**. Seasonality can be observed between:

- a period of low prices starting with the Season B harvest (May-June) and lasting until August;
- followed by a period of increase in prices that generally peaks in November;
- Prices then fall slightly as the small Season A harvest approaches (February).

However, this "typical" seasonality is subject to major fluctuations from one year to the next, mainly due to the more or less late start of the Season A harvest. Price variations between harvest and lean periods average 18%, but this can exceed 30% in some years.

Since 2014, the **shortage of Burundian currency** has led to an ever-widening decorrelation between the BIF's formal exchange rate and the prevailing rate in the informal economy. Since 2022, the unofficial BIF/USD exchange rate has averaged 64% higher than the official exchange rate.

Despite the low rice imports, there is a **correlation between rice wholesale prices in Tanzania and retail prices in Burundi** (in USD at the unofficial market exchange rate). As Tanzanian rice is reputed to be more fragrant, and consumed by urban dwellers, it is not surprising that its wholesale price remains higher than the retail price of Burundian rice, considered by consumers to have inferior quality.

Because of Burundi's self-sufficiency in rice, the trends in prices of Tanzanian rice (which are influenced by international prices) do not sufficiently explain changes in prices of Burundian rice. We note, for example, the impact of the significant increase in Burundian rice production between 2018 and 2019 on prices, which decreased more rapidly than Tanzanian prices and are very close to the FOB prices of major Asian Exporters.

The retail price of Burundian rice, adjusted to the unofficial exchange rate, is lower than the Tanzanian wholesale price, this might explain the informal export flows.

From August 2022 onwards, the retail price of rice soared above the BIF 3,000/kg mark because of inflation and the increase in world rice prices (reduced harvests in Asia due to El Niño, followed by the ban on rice exports from India). Again, the rice price showed a downward trend during the 2023 Season B harvest (June), then increased again to reach BIF 3,666/kg in March 2024*[33]*.

[32]Source: INSBU (2023), Burundi Food Stock Analysis Report 2020-21

[33] Source: FPMA

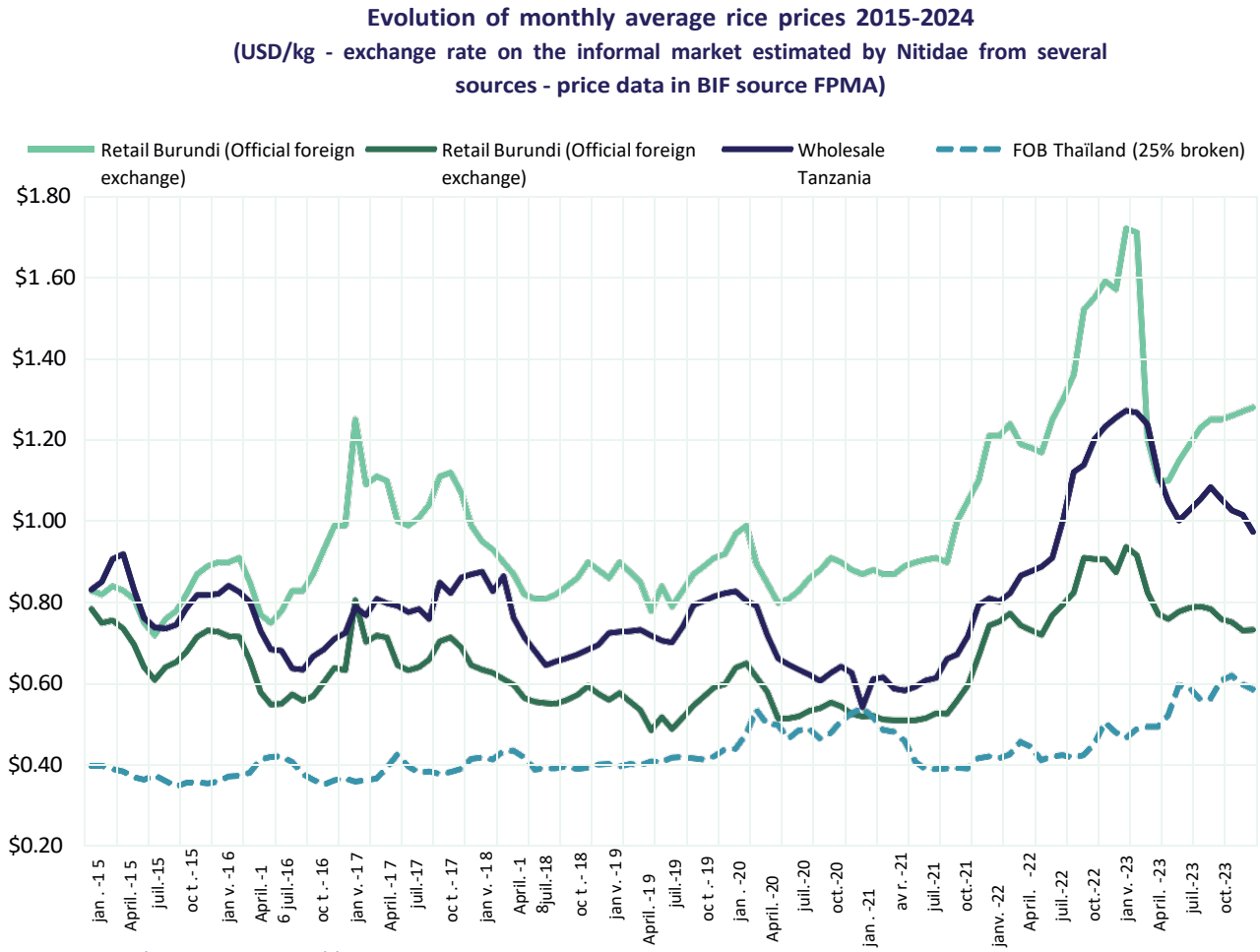


Figure 13: Trends in Average Monthly Rice Prices 2015-2024

3.4. Value Chain Links in Burundi

3.4.1. Supply of Inputs

The use of conventional inputs, namely, improved seeds, mineral fertilizers, and phytosanitary treatments has increased remarkably over the last decade in Burundi.

Seeds

Upstream of the rice value chain, the main support services providers are the **Research Institutions for improved rice varietal**. These institutions include the Institute of Agronomic Sciences of Burundi (ISABU), the Faculty of Agronomic Sciences (formally FACAGRO or now the Faculty of Agronomy and Bio-Engineering (FABI) of the University of Burundi) *[34]* and the International Rice Research Institute (IRRI), with a Regional Office for Eastern and Southern Africa based in Burundi.

In this seed sector, variety development is in two phases: (i) pre-validation of varieties by IRRI and (ii) validation of varieties by ISABU. The approval of seed varieties is carried out by the National Seed Control and de Certification Office (ONCCS). In its 2020 Catalog, the ONCCS authorizes 48 rice seed varieties, including one hybrid variety, whose registered breeders are mainly ISABU and IRRI. These Research Institutions are also involved in the maintenance of the germplasm (Gene Bank) and the

[34] The former FACAGRO played a leading role in developing rice growing on the high-altitude marshlands through its project to improve rice growing on the high-altitude marshlands. The hybrid population method was used to limit the effects of the main biotic constraints (blast disease and bacterial blight) and abiotic constraints (spikelet sterility due to low night-time temperatures). Sequenced varietal tests (grading, confirmation and multi-local tests) and comparative agronomic tests on best farming practices (fertilization, phytotechnics, etc.) have sustained rice research work for nearly two decades.

development of a harmonized technical data sheet on rice cultivation through the Improved Rice Cultivation System (SRA), an adaptation of the Intensive Rice Cultivation System (SRI) whose application requirements are not met in the context of Burundi's rice-growing soils.

Fertilizing and Plant-care Products

Fertilizer imports into Burundi have increased from 5,000 to 50,000 tons per year between 2012 and 2022. The increase in using phytosanitary treatments, on the other hand, appears to be much more moderate.

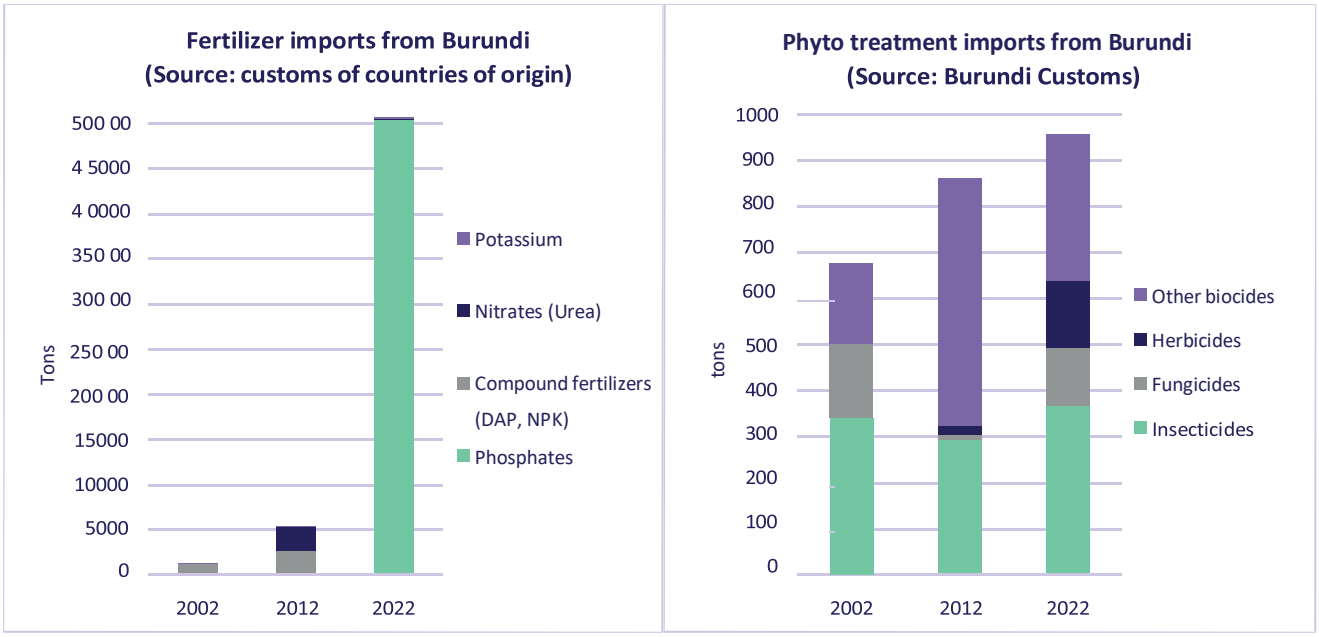


Figure 14: Burundi's Fertilizer and Pesticide Imports

The supply of inputs to farmers involves a wide variety of Small and Medium-scale Sellers who travel to every weekly rural market or run stores in the towns.

In addition to the hundreds of independent agro-dealers, the American NGO, One Acre Fund, through its Burundian subsidiary Tubura, which opened in 2012, is developing a huge local sales network present in seven Provinces *[35]* that supplies inputs on credit to over 290,000 households. Last season, Tubura distributed 300 t of improved seeds and 10,000 t of organo-mineral fertilizers *[36]*. Currently, Tubura provides the largest distribution network for agricultural inputs and small equipment in Burundi. Other initiatives, such as Auxfin, are following suit.

While the distribution of inputs is relatively liberalized, the **supply of mineral fertilizers** to these sellers is highly **regulated by the State**. Through various programs *[37]* and Projects*[38]*, a pre-order mechanism (vouchers) and a monopoly of fertilizer imports granted to the Formulation and Packaging Company FOMI since 2019, the State controls and subsidizes the supply of mineral fertilizers throughout the country.

With **the FOMI Factory** facing many risks (energy supply, lack of foreign currency to import mineral elements, machine breakdowns, etc.), **its offer is struggling to meet the needs expressed** throughout

[35] Muramvya, Gitega, Ngozi, Kayanza, Mwaro, Muyinga and Bujumbura Rural, more than 291,000 households served in 615 hills during Season A 2023-2024.

[36] Source: Interview with FOMI.

[37] These include the National Fertilizer Subsidy program in Burundi (PNSEB) and the National Seed Subsidy program (PNSS).

[38] Notably the Burundi Agricultural Productivity Support Project (PAPAB) 2015-2020 and the Responsible and Integrated Soil Management Support Project (PAGRIS) 2020-2024.

the country. The plan to build a second fertilizer production plant was announced in 2023*[39]* but construction has not yet begun. Farmers also complain about the lack of formulations adapted to different commodities with soil and climate contexts.

3.4.2. Rice Production

Burundian farms are characterized by **very small-sized cultivated areas: 0.6 hectares on average**. However, this average does not reflect **the heterogeneousness of farm sizes**. Our surveys conducted on 213 rice producers in Burundi's 15 rice-producing Provinces in March 2024 bear witness to this heterogeneousness, with **24% of respondents harvesting less than 150 kg of rice per season as against 15% harvesting more than 1,200 kg/season**. The average is 743 kg/season.

67% of respondents grow rice in developed marshlands, 29% in undeveloped marshlands and 8% grow rice outside marshlands.

These rice farms are extremely diversified, **growing an average of six other crops** in addition to rice, including beans (90% of rice farmers surveyed), maize (76%), cassava (69%), sweet potatoes (66%) and bananas trees (57%). Unsurprisingly, farmers in the provinces without hydro-agricultural schemes (Kirundo, Muramvya, Cankuzo and Rutana) show a higher level of diversification, with nine to ten crops, including rice. Support services (including IRRI) report that they have difficulty convincing farmers in developed areas to include rotations with other crops to preserve the soil: they do not hesitate to continue to grow three rice cycles a year when they can. It is also difficult to impose on producers the idea of using varietal diversity within one cultivated area to avoid the risk of epidemics or indeed pests because the producers are keen on using hybrid varieties that give the best yields above all else.

These quantitative surveys and our field observations have led to a summary typology of three rice-growing farming systems:

- **Farms** growing rice on **developed marshland and plots of arable lands measuring 0.25 ha or more**. The rice-growing farms are less diversified in growing other crops because a huge part of the farmers' labour force is dedicated to growing rice. The rice farmers can carry out two or even three rice-growing cycles back-to-back per year. As a result, production exceeds 1,000 kg of paddy rice per cycle on the plot they farm. This enables them to market more than a tonne per year. The rice so produced is their primary source of income. In some recently irrigated arable lands, rice producers are not owners but tenants of the land they cultivate because investors own those irrigated areas.
- **Farms growing rice on irrigated arable lands with a plot size of less than 0.25 ha. Rice is not the main crop grown on these farms. The farmers carry out** one or two cropping cycles back-to-back per year on these small plots of land. Depending on the success of the cropping cycle, they harvest between 300 kg and 1,000 kg per cycle. They consume a large part of their produce and sell several hundreds of kilograms of the surplus.
- **Diversified farms, cultivating other crops, on small-sized plots of lowland**, outside the irrigated areas. They grow rice by flood-land cropping method or manual irrigation. The diversified farms often produce less than 300 kg of paddy rice, and the farmers carry out only one cropping cycle. They consume most of their produce themselves, and only sell surpluses of tens of kilograms.

In its diagnosis of the paddy rice sector (2018), CAPAD estimates that 65% of the rice produced nationally is sold (and 35% is consumed by the farmers themselves). This average is probably close to reality but should be considered as representing mainly the first two farm categories.

[39] https://burundi-eco.com/bientot-une-deuxieme-usine-de-fabrication-des-engrais/

Current government policies tend to call into question this diversified, agro-ecologically intensive cropping system on small-sized plots of land: whether through regionalization of crops or promotion of "radiation centers" (pooling lands), monoculture (maize without cropping it together with beans, in particular) is promoted as a model aimed at increasing yields from the main crop.

It is also important to note that the traditional division of labour in rural Burundi means that **most of the family plots are cultivated by women**. In many rural households, men are involved in other activities (transport, construction, charcoal-burning, livestock farming, etc.), while women take care of the bulk of unpaid agricultural tasks. Despite the predominance of women in agriculture, including rice cultivation, the traditional Burundian land tenure system rarely grants them land rights. *[40]* Consequently, they often depend on their spouses for investment decisions and the spending of income made from the harvest. In our quantitative surveys conducted on 213 rice farmers in March 2024, 61% were women. Yet these surveys also showed that women have less access to developed marshlands than men (65% of women respondents, as against 70% of men respondents). The unpaid nature of farm work performed by women on behalf of the family, and the risk of not having access to the income generated from this work, are all risks of gender-based economic violence.

Figure 15: Access to developed marshlands by farmer gender (Source: Surveys)

In conclusion, it should be noted that **producer organizations (Cooperatives)** are more in the rice sector than in other agricultural cooperatives and play a **relatively minor role in rice marketing**. The main activity of rice-producers cooperatives is the collective management of "neighborhoods" within irrigated perimeters and the collective purchase of inputs, or even collective work and the management of rice nurseries. When marketing is done by grouping, the volumes produced often cover reimbursement of in-kind inputs by members.

Rice producers receive technical training and support from the agricultural extension services of the Ministry of the Environment, Agriculture and Livestock (MINEAGRIE) and the various TFPs *[41]*. The intervention strategy is based on providing inputs, disseminating technology and promoting social engineering services *[42]*. In the Imbo Plains, the Regional Society for the Development of Imbo (SRDI) also trains and supervises rice producers and supplies agricultural inputs on credit *[43]*. The constraints and risks in growing paddy rice are manifold: soil erosion and flooding which silt up the marshlands; water management, phytosanitary pressure, environmental risks (methane (CH4) emissions), fertilization issues, pesticide residues, soil salinity, uncontrolled entry of biological material due to porous borders, etc.

40 https://www.fao.org/3/ak159f/ak159f14.pdf and testimonials: https://www.capad.info/spip.php?article240

41 The Government of Burundi's most active Technical and Financial Partners in the development of rice farming include the International Fund for Agricultural Development (IFAD), the World Bank (WB), Belgian Technical Cooperation and the Food and Agriculture Organization of the United Nations (FAO).

42 Social engineering services mainly involve structuring rice producers into marshland user associations to improve water management and collect water charges.

43 Until 2011, SRDI trained and supervised 17 rice producers' associations represented by the Collective of Rice producers' Associations (CAPRI). When SRDI went bankrupt, these Associations joined the Confederation of Farmers' Associations for Development (CAPAD).

3.4.3. Processing Paddy Rice into White Rice

Downstream paddy rice cultivation, hundreds of **small-scale mechanized hulling units are in place**, most of which are equipped with Chinese-manufactured H30 and H50 huller-launder machines. These **traditional hulling units** often lack **drying and machining components**. Drying of the paddy rice takes place just about everywhere, especially along main roads on the tarmac. Rice quality leaves much to be desired because impurities (sand, stones, plant debris, etc.) are not sufficiently separated from the paddy rice before hulling. Thus, a mixture of rice grains with high levels of broken grains and impurities is often obtained at the end of the hulling-laundering operation.

Figure 16: Drying of paddy rice in front of traditional processing units and semi-industrial mini-rice processing factory in Ngozi.

SRDI has a **modern rice milling** unit but is experiencing operating (financial) difficulties *[44]*.

The **Confederation of Farmers' Associations for Development** (CAPAD), through its agricultural produce marketing company (SOCOPA), has installed **two mini-rice processing factories** in **Gihanga** and **Muramvya**.

Thanks to TFP support, **rice producers' cooperatives** have been established, equipped with storage sheds, drying space and hullers with greater capacity.

Thanks to support from the IFAD-financed Sector Development program (PRODEFI), **two mini-rice processing factories** have also been built in **Gihanga** (Imbo Plains) and **Gashikanwa** (humid plateau zone). Hullers of the mini-rice processing factories have the advantage of separating the paddy rice from various impurities as well as sorting and grading the white rice grain according to the percentage of broken rice. The average milling process yield for 100 kg of milled paddy rice is 65 kg of white rice, 15 kg of rice bran, 19 kg of husks and 1 kg of various losses.

It should be noted that all over sub-Saharan Africa, industrial "mini-rice processing factories" with high capacity of (over 1 ton/hour) have limited economic performance compared with traditional mechanized units. On the one hand, this is due to a significant increase in fixed costs (employees, equipment, buildings) compared to smaller rice processing units, which work both on a contract basis (providing services for rice farmers or traders) and for the rice producers themselves, rarely involving

[44]In normal times, SRDI produced around 10,000 tons of paddy rice grown on around 4,000 hectares. The 6,500 tons of white rice produced after the rice milling process were mainly sold under contract to the Army and the National Police Force. The cash flow deficit resulting from the default on reimbursements of these two institutions compelled SRDI to reduce its purchases of paddy rice. Another major customer is the Brewery of Burundi (BRARUDI), which used to buy mainly cargo rice. In 2014, this brewery offered a contract to supply 200 tons of white rice monthly for one year. Although signing this contract could boost SRDI's cash inflows, milling defects are still the weak link in the chain of Burundi's rice sector, in the context of competition from long-grain, fragrant rice imported from Tanzania and Asian countries.

more than 1 employee. On the other hand, this low level of competitiveness is due to the ability of these rice processing factories to structure and establish customer loyalty to the hundreds or even thousands of rice producers needed to supply them with paddy rice. The rice producers have the possibility of husking their rice themselves with traditional units and marketing it in variable quantities throughout the year. Consequently, many rice farmers have no interest in delivering the paddy rice they grow to an industrial company on a one-off basis. In conclusion, these rice processing units, which claim to compensate for their higher production costs by upgrading the quality of their rice, are struggling to compete with fragrant rice imported from Asia, which occupies the high-end rice market.

3.4.4. Rice Trade and Distribution

In contrast to the more structured national sectors in other countries, where there is a clear separation between aggregators (who collect surpluses in production zones), wholesalers (who manage the transport from surplus zones to rice processing factories and consumption centers), semi-wholesalers (who receive and stock shipments in major consumption centers) and retailers (who sell to consumers in grams or kilograms), the highly decentralized structure of Burundi's **trade schemes** limits specialization. On a local level, many traders are simultaneously aggregators, semi-wholesalers and retailers. Some of them, notably in Gitega and Bujumbura, are also importers (when local production is lacking) and wholesalers (able to charter trucks from other regions).

Our field surveys reveal that the trade and distribution of cereals is the preserve of both men and women.

There are about **300 weekly markets** in the country's 119 townships, where rice producers go to sell their surplus produce, usually **carrying their sacks of rice on foot or by bicycle**, or even less frequently by public transport. Some rice producers and small-scale processors act as aggregators within their hills or neighbourhoods, gathering marketable surpluses from rice producers in the surrounding areas and marketing them. At these markets, they sell rice either directly to urban consumers or to local traders.

Local traders sometimes travel to **neighbouring hills** known for their high rice production to buy rice directly from producers (when it's not the grower who acts as a trader). They also frequently offer loans to rice producers, which they repay with the harvest. Most of this local trade involves transportation by small trucks with a payload of 3 to 5 tons.

Supply to Bujumbura's urban market remains the prerogative of **a few wholesalers**, who handle several types of produce and have trucks or the capacity to use the services of a road haulage contractor. The produce is supplied mainly from rice growing zones close to the economic capital (Bujumbura rural, Bubanza, Cibitoke) by collectors who gather rice purchased throughout the province. In this case, wholesalers provide the funds needed to ensure the collection of the produce. There are also inflows of several thousand tons from N'gozi and Kirundo to supply rice to the capital.

Given that harvests and sales by producers are spread out over almost 8 months, and that supply is spatially dispersed, traders' **storage capacities** are generally **limited** to a few dozen tons. The largest wholesalers in Gitega and Bujumbura have warehouses capable of storing several hundred tons. Like production rice storage is therefore highly decentralized. Drying rice insufficiently, particularly during the Season A harvests, storage conditions that are not always optimal and the moderate use of storage treatments can lead to storage losses for some traders.

3.5. Institutional players involved in the rice sector in Burundi

Rice is one of the priority crops targeted by the Government of the Republic of Burundi through the guidance paper for environmental, agricultural and livestock policy (DOPEA) covering the 2020-2027 period *[45]*. In addition to the maize, poultry and pork sectors, this is a targeted sector to establish two agro poles in Cibitoke and Karusi, as part of the Pact for Food and Agriculture (COMPACT, 2023). A national strategy for developing the rice sector in Burundi (SNDR-B) was drawn up in 2014 with flagship activities on the agenda that reflect the links in the value chain: developing, intensifying, processing and marketing. This strategy is aligned with the content of key macroeconomic planning documents such as the Strategic Framework for Economic Growth and the Fight Against Poverty (CSLP) and sector planning documents such as the National Agricultural Strategy (SAN, 2008-2015) the National Agricultural Investment program (PNIA, 2012-2017), the National Food Security program (PNSA, 2009-2015) and the sub-sector strategy for marshland development and watershed protection.

3.5.1. Ministry of Environment, Agriculture and Livestock (MINEAGRIE)

MINEAGRIE's decentralized services, led by the General Directorate of Mobilization for Self-development and Agricultural Extension Services, carry out various activities related to MINEAGRIE's agricultural policies and programs. They are structured under the leadership of the **BPEAE (Provincial Offices of Environment, Agriculture and Livestock)** as follows: one Agronomist per townships, some of whom are Agricultural Engineers who supervise zonal Agronomists (a zone comprises between 10 and 11 hills), with Baccalaureate in Agricultural Science or Agricultural Technician level. These Zonal Agronomists are assisted by Agricultural Monitors stationed at each hill (each one is a native of the local community).

In the Burundian Government's National Agricultural Strategy (2018-27), the **weaknesses** identified from this agricultural training and supervision include:

- *Lack of harmonized approaches to intervention in the field*
- *Low consistency in the dissemination of material*
- *Poor practicality of the link between research work and extension services*
- *Poorly organized producers*
- *Lack of framework for transmitting agricultural information*
- *Allocation of meagre resources for agricultural training and supervision operations*
- *Low involvement of other Technical Departments in the design and distribution of Technical Data Sheets*
- *Lack of a training plan for MINEAGRIE Staff in general and Agricultural Supervisors in particular"*

In its **guidance paper on Environmental, Agricultural and Livestock Policy (July 2020)**, MINEAGRIE calls for the modernization of Burundian agriculture. In particular, MINEAGRIE touches on a policy of regionalizing the growing of crops, but also and above all, the creation of "**outreach centres**" in each townships, to pool arable lands to achieve intensive production by single-crop farming on fields larger than 5 hectares per plot, with the help of a "technical package" (inputs of all kinds) and irrigation techniques. These Outreach Centres, when linked to agricultural research work and extension services, should be able to generate at least 50 jobs each.

[45] According to the DOPEA (2020-2027), other important food crops are maize, runner beans, potatoes, bananas, cassava and taro root.

3.5.2. Burundi Institute of Agronomic Sciences (ISABU)

ISABU was founded in 1962 and now has **six Research Stations** and **thirteen Innovation Centres** across the country. Under the supervision of MINEAGRIE, ISABU publishes a quarterly Agronomic Research Bulletin, helping to popularize knowledge.

Its rice-growing activities are focused on **improved seeds** and, to a lesser extent, pest control. ISABU produces pre-basic seeds, which are then used by multipliers.
ISABU also conducts tests on FOMI's organo-mineral fertilizers to give recommendations in terms of formulation and quantities.

Since 2011, ISABU has also been working with the NGO **CABI** on the **Plantwise** "Plant Clinic" program: "Plant Doctors" are trained and equipped with tablets and information sheets on the various diseases affecting plant crops. They advise farmers and feed a centralized database to monitor the spatio-temporal evolution of these diseases and intervene in the event of an alert.

3.5.3. IRRI

The International Rice Research Institute (IRRI) is an independent, not-for-profit Research and Teaching Institute founded in 1960 by the Ford and Rockefeller Foundations, with the support of the Philippine Government. Based in Los Baños in the Philippines, IRRI's mission is to reduce poverty and hunger through the science of rice.

Its main activities are the following:

- Developing advanced rice varieties that are more productive and resistant to pests, diseases, floods and drought
- Improving the health and well-being of rice producers and consumers
- Protecting the rice-growing environment for future generations

To achieve this, IRRI conducts research with the collaboration of Partners in 17 rice-producing countries in Asia and Africa and employs over 1,000 people.

In Burundi, IRRI entered a partnership with the government and the University of Burundi in 2008 to support rice production. In 2014, IRRI set up its Regional Office and a breeding center for Eastern and Southern Africa in Burundi, making the country a Centre of Excellence for crop improvement for the region *[46]*. Its achievements include:

- Since 2011, IRRI has succeeded in releasing eight new rice varieties adapted to Burundi's ecology, with six other varieties under development. IRRI also holds in trust 52 traditional and improved varieties of Burundian rice to serve as an invaluable genetic resource for breeders.
- IRRI has trained over 80 local Researchers and Technicians in the latest developments in rice research and new technologies. Over 3,000 small-scale farmers have also been trained using the "train-the-trainer" approach, reaching more than 24,000 farmers.
  IRRI has supplied agricultural equipment (tractors, threshers, etc.) to rice-growing cooperatives.
- to improve productivity and reduce production costs.

[46] https://www.irri.org/where-we-work/countries/burundi

After being informed about the succession of two to three rice-cropping cycles on irrigated perimeters without crop rotation, IRRI is also researching to promote crop rotations and enrich the soil by making it attractive to the producers - who dedicate this arable land primarily to cash crops.

3.5.4. The World Food Program (WFP)

Whereas in the past the WFP used to distribute only imported foodstuffs to populations faced with food insecurity, in recent years it has sought to support local farmers by purchasing their produce: In 2021, 7,000 tons of food (including 5,000 tons purchased directly from Burundian small-scale farmers) for a total amount of USD 3.3 Million. The proportion of rice in these purchases is not specified.

3.5.5. Agriculture and Rural Development Sector Group (GSADR)

GSADR (Agriculture and Rural Development Sector Group) is a platform for consultation and coordination, bringing together Ministries, Technical and Financial Partners, and other stakeholders, at both national and provincial levels, to address the challenges of sustainable and resilient agricultural development in Burundi. After several years of dormancy, GSADR's activities were relaunched in April 2021.

The GSADR has several thematic sub-groups (environment, digitization, etc.) and is particularly involved in mainstreaming climate change and sustainable land management issues into agricultural policies and programs. It receives support from the FAO to strengthen its capacity in this area. They hold meetings regularly to assess achievements and challenges in implementing agricultural and rural development programs.

3.5.6. programs and funds for financing agriculture

Credit facilities & financing are available through various programs or banking institutions:

- **For Young People**: through the Investment Bank for Young People (BIJE) and PAEEJ
- **For Women**: the Women's Investment and Development Bank (BIDF) opened in Gitega in March 2022. It aims to empower women financially. The shareholders are the townships (85%) and the State (15%). It grants low-interest loans to women's associations and cooperatives *[47]*.
- Under the supervision of the Ministry of Finance, the Impulse, Guarantee and Support Fund (FIGA) offers support to Project owners in obtaining bank loans, a guarantee fund (50% to 80%) and the granting of subordinated loans. The target groups are women, young people and farmers. Its activities include supporting livestock breeding and the processing of livestock by-products. Souffrant d'un manque de trésorerie, le FIGA est actuellement en cours de réforme afin de permettre l'entrée de nouveaux partenaires dans le fonds (Banque Mondiale, BAD, FIDA, voire UE).

[47] https://burundi-eco.com/bidf-pour-stimuler-competition-dans-secteur-bancaire/ / https://www.iwacu-burundi.org/va-t-elle-reellement-financer-les-femmes/

4_Risk analysis of the rice value chain in Burundi

4.1. Risk Summary

Seventeen (17) major risks have been identified as having an impact on the rice value chain in Burundi. The diagram opposite shows the list of these risks and the players they directly impact.

Weather risks and phytosanitary risks impact **mainly producers**, for whom they cause a drop in production. Indirectly, they impact all the other sector players, by reducing and increasing the rice supply.

Market risks impact **virtually all players** but to varying degrees. Inputs supply difficulties and fall in the price mainly affect input suppliers and producers. On the other hand, price increases have a greater impact downstream in the sector, particularly on processors and distributors: they have to increase their working capital needs and resale prices, and potentially face a drop in sales due to the additional cost to end consumers.

Logistical risks affect all those involved in the **storage or transportation** of rice.

Financial risks significantly impact players whose business relies wholly or partly on bank financing and inputs or machinery imports. In this sense, producers are probably the actors least affected by these risks, even if access to credit for many of them, aims to increase their investment capacity.

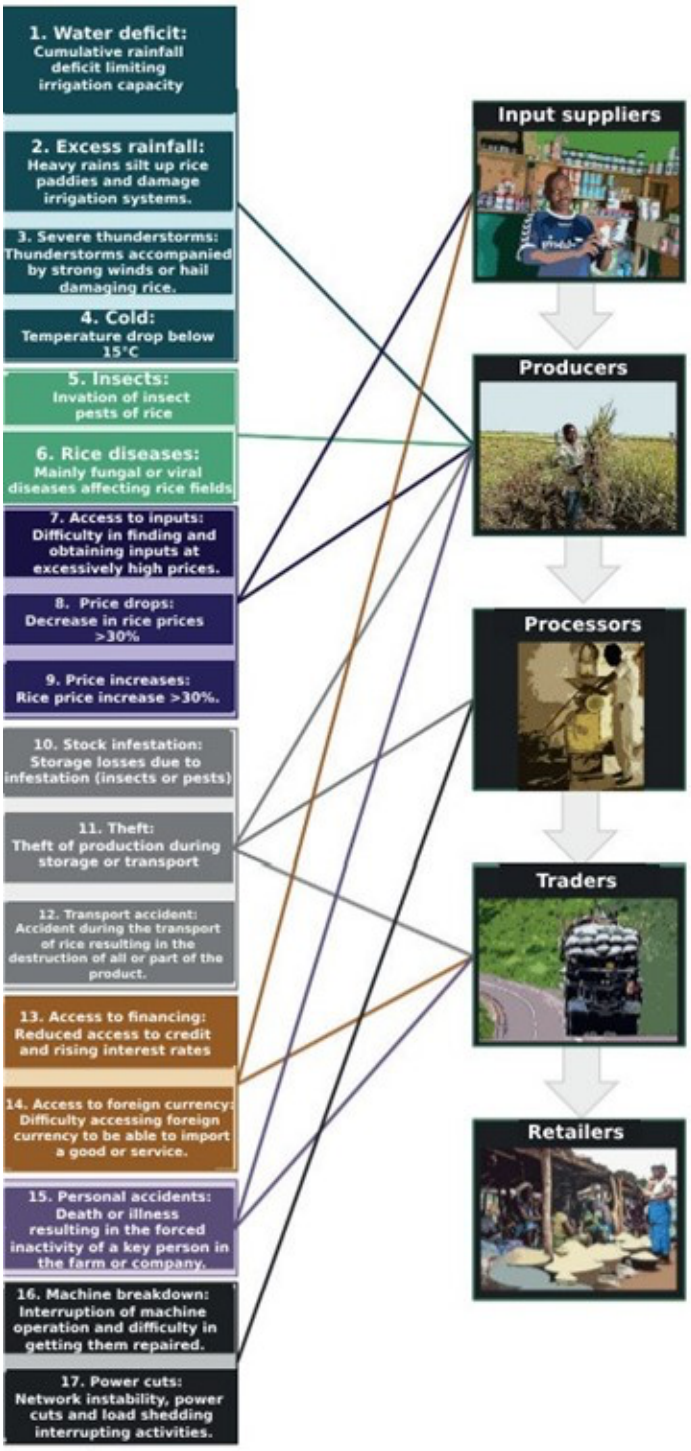


Figure 17: Diagram of the main risks identified and their direct links with players in the rice value chain (source: Authors)

Personnel risks mainly affect **small-scale economic units** (producers, traders, small-scale processors), which are very sensitive to the working capacity of their assets, and more particularly the Farm Manager/Head.

Lastly, **machine risks** mainly affect **those involved in processing the produce** and, to a lesser extent, input suppliers who carry out the mechanized processing or packaging stage.

It should be noted that retailers, who are not very specialized in the rice sector, are particularly impacted indirectly by all the risks affecting the availability and cost of rice.

The risks identified were then analyzed according to the PARM methodology in terms of frequency (probability score), average intensity for each stakeholder affected (average impact score) and extreme impact when their intensity reaches its maximum level (maximum impact score).

Risk frequency			Risk intensity		
Category	**Criteria**	**Score**	**Category**	**Criteria**	**Score**
High probability	Once in every 7 years or more	**3**	**Catastrophic**	Decline in income> 50% Impact on more than 50% of players in the sector Greater impact on women and young people	**5**
Average probability	Once every 15 years or more	**2**	**Review**	Between 30% and 50% drop in income Impact on more than 30% of players in the sector Greater impact on women and young people	**4**
Low probability	Less than once every 15 years	**1**	**Considerable**	Between 15% and 30% drop in income Impact on more than 20% of players in the sector Greater impact on some women and young people	**3**
			Moderate	Between 5% and 15% drop in income Impact on more than 10% of players in the sector Greater impact on some women and young people	**2**
			Negligible	Less than 5% drop in income Impact on less than 10% of players. Low impact on women and young people	**1**

Figure 18: PARM Agricultural Risk Frequency and Intensity Scoring Method

The following paragraphs provide risk analysis by player category, then on the entire rice value chain.

4.2. Risks for suppliers of inputs

In the surveys we conducted, and in particular, the interviews we had with the main suppliers of inputs in Tubura, **it was revealed that the rice sector is the third main outlet for the suppliers of inputs** in Burundi, after the maize (grown by a greater number of farmers) and market gardening sectors (which consume more inputs per unit area, but are smaller in farm size and number of farmers involved).

The sale of inputs **depends significantly on farmers' income and investment capacity**. Significant price falls and most of the risks affecting the farmers, consequently, have an indirect impact on the turnover and revenues of distributors of inputs. Systematic risks can affect rice production, producers' incomes and their ability to repay debts. This is particularly true about weather risks. They therefore have a major impact on the turnover of the agricultural inputs sector.

Phytosanitary risks can, on the contrary, **affect their sales positively** by compelling producers to buy more treatments and seeds selected based on their resistance to certain diseases.

As the vast majority of inputs or the ingredients to produce them are imported, **the risks involved in importing them** (import logistics, prices of fertilizers and the active principles, access to foreign currency, access to credit to finance imports) also have a significant impact on the business of suppliers of the inputs. This impact is even more significant when most sales of inputs are carried out significantly at the start of the two rainy seasons, any delay in the import, preparation/packaging, or distribution process has a major impact on their business over the whole season because **an input that is not made available on time is an input that will not be sold** before several months.

The risk of power outages and machine breakdowns could significantly impact input manufacturing factories, starting with FOMI. As the latter is already producing under-capacity concerning the demand for fertilizers, any stoppage or delay in production affects not only the manufacturing factory itself, but also the distributors of inputs and, indirectly affects the entire value chain.

The inputs distribution sector **has developed significantly in Burundi** in recent years and showed remarkable resilience to the successive crises of the post-COVID years *[48]*, drastically reducing the available inputs in many developing countries. This resilience was made possible by large-scale **national programs** such as:

- the National Fertilizer Subsidy program in Burundi (PNSEB) of 2012, which includes setting up a Common Fertilizer and Soil Enrichment Fund (FCFA) *[49]* in 2013,
- and by **emergency aid from the African Development Bank** (AfDB)*[50]* which facilitated the import of inputs in recent years.
- IFDC's **PSSD** 2018-2024 program is another example.*[51]*
- and the setting up of a subsidiary of **the NGO One Acre Fund** in 2011*[52]*, which deployed a major fertilizer distribution network in the country, thus improved significantly the supply in landlocked localities.

Despite these success stories, the risks to the supply of inputs to the rice sector, and to input suppliers in general, are still significant.

The Table below uses the PARM methodology to rank the main sector risks in order of significance and frequency to which suppliers of inputs are exposed, with a summary justification of the indicators given for each risk.

It is worth noting that frequencies are estimated based on the last fifty years. Risks that are currently very intense, such as the lack of foreign currency or difficulties in accessing fertilizers, need to be seen in the context of the history of the sector and the national economy.

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48 https://blogs.worldbank.org/en/opendata/fertilizer-prices-expected-remain-higher-longer

49 https://faolex.fao.org/docs/pdf/bur143162.pdf

50 https://www.afdb.org/fr/news-and-events/press-releases/le-burundi-recoit-le-soutien-du-groupe-de-la-banque-africaine-de-developpement-dans-des-secteurs-de-developpement-cles-60325 and https://www.agenceecofin.com/investissement/1901-115371-au-burundi-des-producteurs-se-felicitent-des-bons-rendements-agricoles-obtenus-cette-annee-grace-au-soutien-de-la-bad

51 https://ifdc.org/projects/private-seed-sector-development-pssd/

52 https://oneacrefund.org/what-we-do/countries-we-serve/burundi

Suppliers of inputs		Frequency	Intensity		Risk prioritization	
No	Risks	Frequency score (F)	Average impact score (Imoy	Maximum impact score (Imax)	Final score: ((F*Imoy)*.75) + (Imax*0.25)	Comments
11	**Price drops**	3	3	4	7.75	Lower prices can lead to a drop in the purchasing power of rice producers and their disinvestment and this will sharply reduce sales by suppliers of inputs.
17	**Power outages**	3	2	5	5.75	The suppliers of inputs that carry out formulation processes (grinders and mixers), repackaging (packaging line), or controlled atmosphere storage (mechanical ventilation, air conditioning) can be severely affected by power outages. The outages are frequent (several times a week). When power outages are prolonged and occur during peak periods (at the start of the season), the impact on suppliers of inputs and the supply of inputs over the whole season can be enormous.
10	**Difficulties in accessing inputs**	2	3	5	5.75	Most of the inputs or ingredients for the production of inputs are imported. Consequently, the suppliers of inputs depend very much on the availability and cost of inputs on the international market. In times of logistical crises (such as the container crisis of 2021) and high fertilizer price inflation on the international market (100% increase in 2022), their ability to procure supplies in time for their sales windows and offer affordable prices for producers may be severely jeopardized, resulting in huge volumes of losses in their business.
14	**Difficulty in accessing foreign currency**	1	4	5	4.25	Most inputs are imported either as ingredients or in ready-to-use form. Whether they import or buy inputs from an importer or industry, the suppliers of the inputs are heavily affected by the lack of foreign currency. As their business is highly seasonal, a delay in imports due to difficulties in obtaining sufficient foreign currency can result in huge losses in their business.
16	**Machine breakdown**	2	2	5	4.25	The suppliers of inputs who themselves carry out formulations (blending), like FOMI or repackaging (in sachets, vials, etc.), of imported active principles can be affected by machine breakdowns, especially when their equipment is scarce in Burundi and spare parts, or the Mechanics have to come from abroad.
15	**Personal illnesses and accidents**	2	2	4	4.00	Even though sellers of inputs often operate as sole proprietorships or with a small number of employees, it is relatively easy for them to call on a family member to run the store if they are unavailable, and this limits the impact of illness and accidents.
1	**Water deficit**	3	1	4	3.25	Systemic weather risks can significantly affect the volumes of inputs the suppliers provide, by reducing rice producers' purchasing power, causing non-repayment of inputs supplied on credit, and delaying sales periods against the expectations of the suppliers.
2	**Excess rainfall**	3	1	4	3.25	
13	**Difficulty in accessing financing**	1	2	3	2.25	The suppliers of inputs usually have privileged access to bank financing. For small-scale suppliers with little collateral, however, the decline or increased cost of credit during economic, financial or political crises can lead to a drop in cash flow and, consequently, a substantial drop in business volume.
8	**Thefts**	1	1	5	2.00	Product and cash theft, although infrequent, can cause huge losses for the suppliers of inputs when large amounts are involved.

	Suppliers of inputs	Frequency	Intensity		Risk prioritization	
9	Road accident	1	1	4	1.75	Road accidents are frequent in rural areas. Most of Burundi's road vehicles have a low net weight (between 3 and 10 t per truck), which limits the volumes subject to this risk. However, each player can incur huge losses when the entire cargo is destroyed.
3	Violent storms	1	1	2	1.25	Unusual weather risks may slightly affect the volumes of inputs the suppliers provide in their business by reducing producers' purchasing power and leading to non-repayment of inputs supplied on credit.
4	Cold wave	1	1	2	1.25	The same applies as in the case of violent storms, but with less impact because few areas are affected.
7	Stock infestations				0.00	Distributors are not affected by this risk. Their fragile products - the seed stocks, are systematically treated.
12	Price increases				0.00	Price increases will usually lead to increased investment in cultivation by producers, and consequently, higher volumes of inputs provided by suppliers in their business. It's not a risk for them.
5	Insects				0.00	Insect attacks and diseases lead to an increased demand for phytosanitary treatments and resistant varieties and are therefore not a risk for the suppliers of inputs.
6	Rice diseases				0.00	

4.3. Risks for rice producers

The production link is sensitive particularly because it involves **the largest number of players** and influences all the other links (either because it is the outlet or the main source of supply). That's why this link was the subject matter of a much larger series of interviews than the others. In addition to the twenty or so producers that met with the experts during the field mission, a short survey was carried out among 213 rice producers, namely, female rice producers (129) and male rice producers (84), spread across all of Burundi's 15 rice-growing Provinces. This was used to prioritize the frequency and intensity of the main risks identified by the experts. Average and maximum intensities are measured in losses (as a proportion of each farm's average production) for farms affected by the risk considered. Attention was paid to the risk frequencies declared by women rice producers about the survey population as a whole, to see if certain risks affected women more frequently. This does not seem to be the case, because the differences are not huge.

	Frequency	Women rice-grower frequency	Average intensity	Maximum intensity
Insects	22%	21%	25%	100%
Lack of rain	19%	19%	43%	87%
Stocks infestation	16%	16%	9%	80%
Price reduction	16%	15%	24%	67%
Rice diseases	14%	11%	36%	100%
Infrastructure damage	11%	12%	42%	100%
Access to fertilizer	10%	10%	32%	73%
Personnel illness	8%	8%	49%	100%
Hail	6%	5%	49%	100%
Siltation	6%	7%	35%	100%
Access to seeds	5%	5%	31%	75%
Access to organic fertilizer	5%	5%	28%	60%
Difficulties in drying	5%	4%	11%	34%
Seed quality	4%	4%	40%	80%
Quality of phyto inputs	4%	4%	35%	80%
Theft	1.4%	1.0%	43%	100%
Fertilizer quality	1.3%	1.4%	27%	50%
Road accident	0.8%	0.6%	12%	93%
Personnel accident	0.6%	0.6%	45%	100%
Cold	0.3%	0.3%	46%	73%

Figure 19: Frequency and intensity of risks reported in surveys of 213 women rice-producers and men rice-producers

Rice is subject to a **wider variety of insect attacks** *[53]*, including many pests imported from Asia via the staple rice stocks. A distinctive feature of rice production seems to be the regular outbreak of new pests, which compels producers to constantly seek new advice, varieties, techniques and treatments to control phytosanitary pressure.

With the backdrop of climate change and trade globalization, the frequency and intensity of new sources of phytosanitary pressure, particularly, insect pest populations, is set to increase over the coming decades. The field mission already revealed that rice producers on the **Imbo Plains** - where accelerated

[53] http://books.irri.org/9712200280_content.pdf

increases in average and maximum **temperatures are recorded**, as indicated below - are battling with the rise in the number and **diversity of pests**.

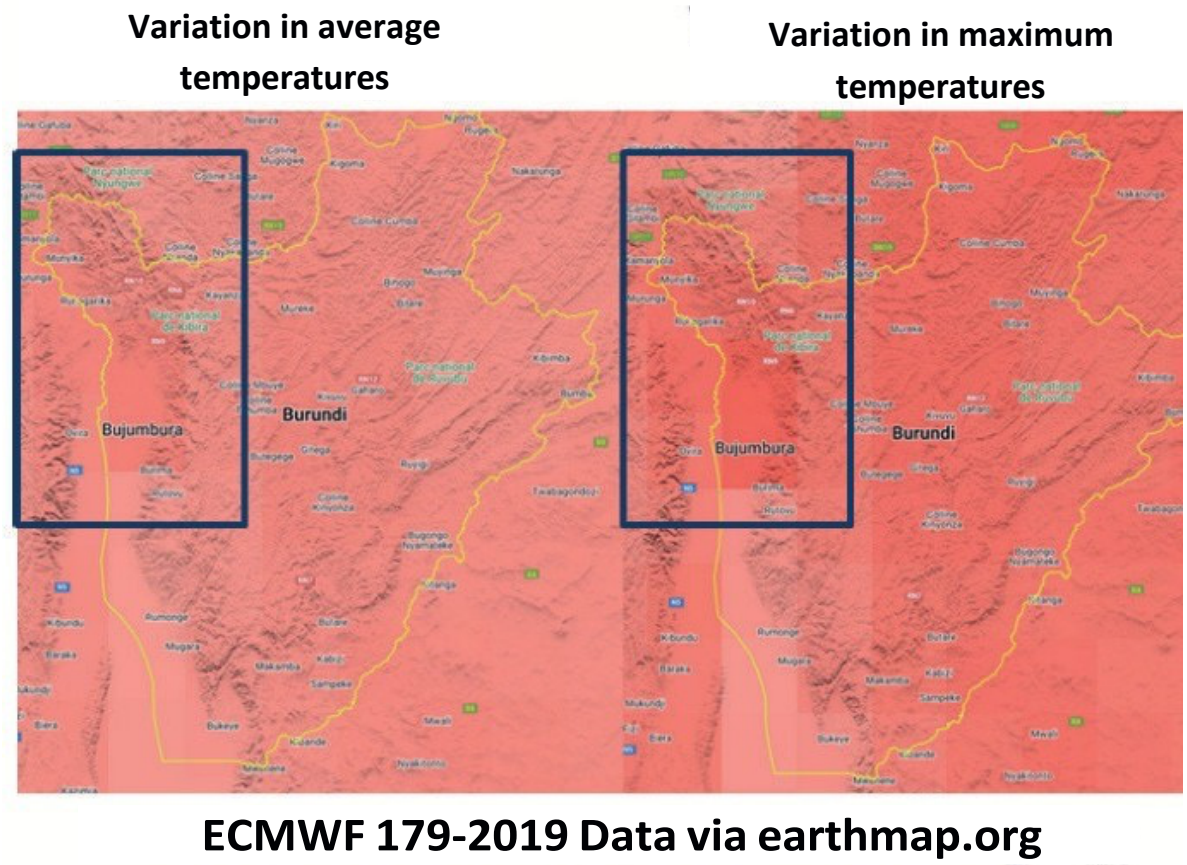

Figure 20: Accelerated rise in temperatures on the Imbo Plains (Source: ECMWF)

Weather risks, whether excess or intermittent rainfall, undoubtedly affect producers the most: a focus on this point is provided below, in the 4.4 Detailed weather risk analysis section.

In conclusion, **market risks** have a substantial impact on producers: falling prices, like what happened in the wake of the increase in production between 2018 and 2020, can undermine their expectations of income from the sale of surpluses.

The availability and cost of inputs on the market can also significantly impact yields.

The Table below classifies the main risks for farms growing rice in Burundi. The analyses and score calculations are based on the quantitative survey data and qualitative interviews conducted by PARM experts during their mission. Certain risks have been grouped (availability of inputs, diseases and accidents, thefts, drying conditions with excess water) to make the analysis easier to understand.

Qualitative elements, derived from literature reviews and qualitative interviews during the experts' study, have been added.

producers		Frequency	Intensity		Risk prioritization	
No	Risks	Frequency score (F)	Average impact score (Imoy)	Maximum impact score (Imax)	Final score: ((F*Imoy)*.75) + (Imax*0.25)	Comments
1	**Water deficit**	**3**	**4**	**5**	**10.25**	Rice cultivation, whether rain-fed without full water control or on developed perimeters with water control, depends on available water. The water deficit directly affects yields, and indirectly promotes insect attacks and weed pressure (algae and herbaceous weeds) by limiting the immersion capacity of arable lands. Surveys conducted among rice producers have shown that this is a major risk for frequency (practically during one year within five years) and intensity (average losses of 43%, maximum losses of 87% of expected production).
5	**Insects**	**3**	**3**	**5**	**8.00**	Rice is subject to a wide variety of insect attacks (on a global scale, over a hundred insect species attack rice, twenty of which cause enormous damage), including a growing number of pests imported from Asia through stocks of staple rice. In addition to lepidopterous caterpillars, the main insect pests cited by producers include flies and midges (notably Diopsis thoracica and whiteflies Aleurocybotus indicus), aphids, locusts and mole crickets. producers report that the frequency and losses due to these attacks are particularly substantial. In addition, climate change already seems to be encouraging the development of new attacks, as mentioned above.
11	**Price drops**	**3**	**3**	**4**	**7.75**	Surveys conducted among women rice farmers and male rice producers, and the history of WFP prices, show that rice selling prices in Burundi are subject to intra-annual seasonality and significant inter-annual variability. The substantial increase in national production between 2018 and 2022 has notably caused a structural decline in rice prices, excluding inflation and currency devaluation. While the rise in international market prices in 2023 has helped prices to recover, many producers who invested in rice cultivation made losses in recent years due to prices that fell well below their targets. This is a major risk, especially when local rice is subject to competition from imported rice (from Asia and Tanzania), which urban consumers consider as better quality than local rice.
2	**Excess rainfall**	**2**	**4**	**5**	**7.25**	Heavy rains, which occur practically once every two years over the last decade and once every four years in previous decades, frequently damage rice farms and perimeters. Excessive water regularly causes siltation/silting-up of the arable lands, making it impossible to submerge the rice and requiring major dredging work to make the lands useful again for cultivation. Heavy rains after transplanting can also wash away seedlings and reduce the harvest potential to nothing. In conclusion, the most violent rains can damage or even destroy rice farming facilities (small dikes, dykes, canals, dams, earthworks), rendering areas unusable for cultivation during one or even two seasons. producers have indicated that the frequency of heavy rainfall destroying their crops and agricultural facilities occurs more than once every 10 years and causes average losses of over 40%. In extreme cases, the entire produce is destroyed.

producers		Frequency	Intensity		Risk prioritization	
15	Personnel illnesses and accidents	2	4	5	7.25	All the rice producers we met underscored that rice cultivation is an extremely arduous and labour-intensive enterprise. In addition, working in mostly wetland areas, rice producers, more than other farmers, are exposed to mosquito bites and malaria. Young farmers and farms run by widowed women, who tend to practise less diversification and have a smaller family workforce, are particularly exposed to these unusual risks. In particular, several women indicated that the reduction in their work force during pregnancy periods could be the cause of a significant loss of income (reduction in cultivated area or achieving only one cropping season out of two). The frequency of diseases and accidents causing losses in rice cultivation is close to once every 10 years. The average loss is 49% and the maximum loss 100% of the crop.
10	Difficulties in accessing inputs	2	4	5	7.25	The use of inputs (selected seeds, mineral fertilizers, insecticides) in rice cultivation is much more widespread in Burundi than in other crop cultivation (except for market gardening). The accessibility and cost of inputs therefore have a major impact on rice producers. The respondents all pointed out that the difficulty in obtaining inputs at the right time occurred about once every 10 years, and that the average losses caused were more than 30% (and the maximum losses observed over 70%). ENAB 2019-20 confirms the data provided, with a sharp drop in the use of improved seeds compared with previous seasons. The current duopoly (ISABU - IRRI) on the supply of seeds and the monopoly on the supply of fertilizers may encourage these issues in the supply chain. If one of these entities faces difficulties in producing or distributing these inputs, many producers are affected.
6	Rice diseases	2	4	5	7.25	Viral diseases caused by (rice yellow mottle virus) and above all fungal diseases caused by (pyriculariosis, oryzae, sarocladium oryzae, Cercospora janseana, and Drechslera oryzae) have very high prevalence in rice cultivation. The frequency (more than once every 10 years) and the average intensity (36% losses) are both high, according to the rice producers interviewed. The data is confirmed by the Plantwise Project (Plant Clinics), which records a lot of farmers who go to the Pant Clinic for professional advice, particularly for cases of rice blast (28% of consultations concerning rice cultivation).
7	Stock infestations	3	2	5	5.75	Rodents (mice and rats) and insects (moths and weevils) cause frequent but usually moderate damage to rice stocks, particularly when producers are not equipped with suitable containers and have no treatment facilities. These attacks are frequent, but their average intensity is normally moderate (9% losses). However, serious cases involving losses of over 75% of some stocks have been recorded.
3	Violent storms	1	4	5	4.25	Although violent storms involving strong winds and even hail are less frequent, they can cause considerable damage to rice fields, particularly when the rice is approaching maturity, causing the pre-harvest falling and scattering of rice grains.
8	Thefts	1	4	5	4.25	While theft of standing crops is limited in the rice sector (unlike in the maize sector, where theft of maize on the cobs is much more frequent), theft of rice stocks from homes or storage warehouses can occur and this causes huge losses for producers.
4	Cold wave	1	4	5	4.25	Rice is sensitive to particular drops in temperature, and can be severely damaged (stunted vegetative development, aborted grain formation) when temperatures fall below 15 degrees Celsius In mountainous areas such episodes are not very frequent though, but they can cause very huge losses.

producers		Frequency	Intensity		Risk prioritization	
12	Price increases	2	1	3	2.25	In normal times, the vast majority of Burundian farms are self-sufficient in starch crops (sources of slow sugar). Even when the rice harvest is disappointing, cassava, sweet potatoes, potatoes and bananas - all highly resilient crops - can provide for basic needs. For farms in very precarious situations, particularly those with extremely limited access to land (less than 0.25 ha) or a reduced workforce (1 single worker), the purchase of cereals and tubers during the lean season can be impacted by a price rise.
13	Difficulty in accessing financing	2	1	3	2.25	Access to financing is very seldom a condition for rice cultivation. It's more a question of improving farming conditions, to which few Burundian rice producers have access at this stage. With the development of financing directed at the agricultural sector, however, it is important to consider that access to finance could, in the future, become a source of risk for farms accustomed to financing part of their factors of production through credit.
9	Road accident	1	1	4	1.75	Usually, producers cart their produce from their rice fields to their homes, and from homes to the nearest marketplaces (urban centres). Accidents are rare on these short-distance trips, whether by hand or by bike, but when they do occur, they can lead to significant losses.
14	Difficulty in accessing foreign currency	1	1	2	1.25	To date, very few producers have been directly affected by the lack of access to foreign currency. They are indirectly affected by the impact of difficulties in accessing foreign currency for other players in the sector, and by the resulting inflation on the costs of inputs.
16	Machine breakdown				0.00	Few rice producers are equipped with processing machinery. The rice producers equipped with machinery to process their produce are subject to the same risks as the stakeholders involved in processing rice.
17	Power outages				0.00	

4.4. Detailed weather risk analysis

They include structural risks identified by all operators in the rice sector (and cereals in general) as the **main risks affecting the value chain**. These structural risks may affect the national supply, including the rice producers, and cause all players in the sector to make losses. This happens when there is **a reduction in the rice quantity** available, thus, encouraging **price increases** and **supply difficulties** especially if, like in 2023 and 2024, foreign currency scarcity makes cereal imports difficult.

Weather risks can also encourage other risks, notably concerning pests, marketing, and even people's health (malaria, respiratory diseases) and the workforce. These systemic risks have a huge impact on the rice value chain.

4.4.1. Detailed weather risk analysis

As detailed above, Burundi's equatorial, highland climate provides a cumulative rainfall pattern, generally over 1,000 mm per year and is thus **not subject to "droughts"** strictly speaking. The farming system involving two successive cropping seasons back-to-back, on the other hand, can be severely disrupted when one of the two cropping seasons does not record enough rainfall for good crop development.

Rice cultivation is highly dependent on the availability of water. In the past, it was mainly a flood-recession crop (Seasons B and C), however, recent hydro-agricultural developments have enabled rice cultivation to increase, particularly in Seasons A and B, although it remains highly dependent on rainfall. In comparison, beans, potatoes and market gardening crops can withstand low rainfall patterns whereas bananas sweet potatoes and cassava build up their development cycle over a much longer period and can thus withstand less heavy rainfall.

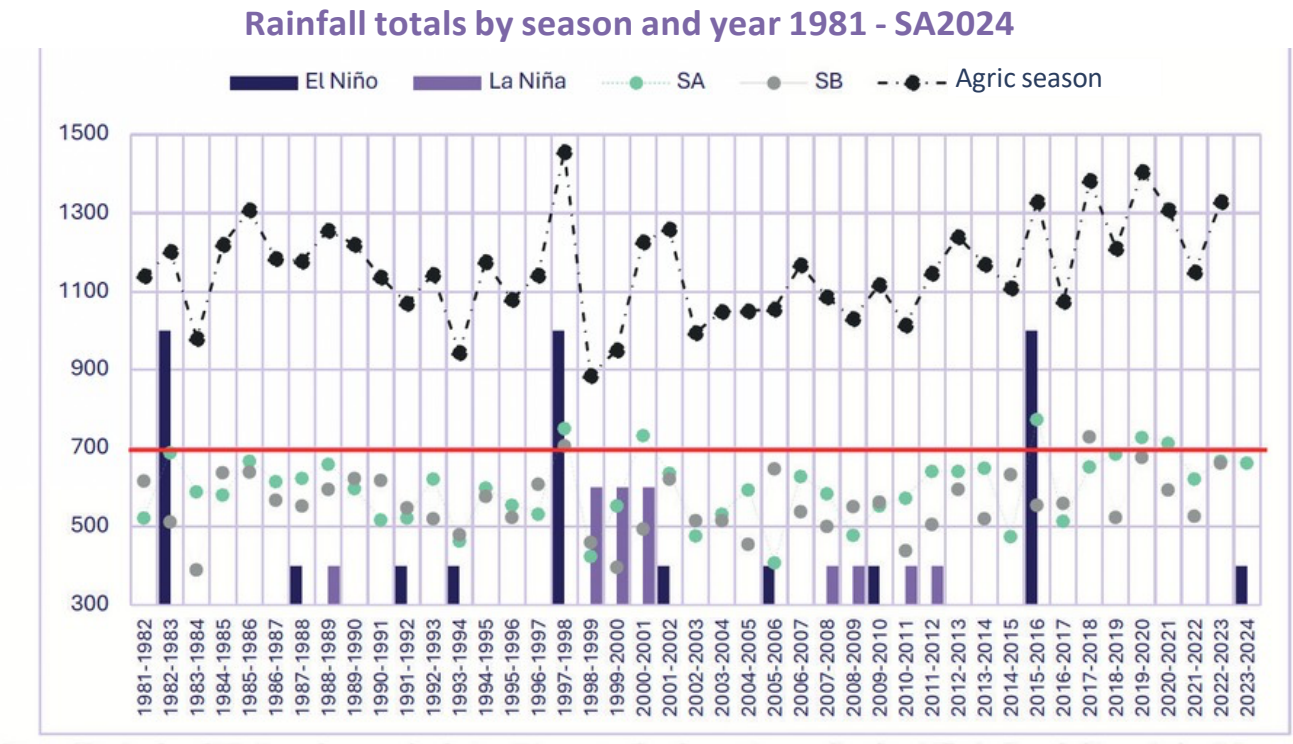

Figure 21: Historical analysis of rainfall totals over the two growing seasons and illustration of the impact of El Nino (normal and major) and La Nina (normal and major) climatic events on rainfall. National CHRIPS data analyzed and formatted by Nitidae + history and intensity of El Nino and La Nina events extracted from NOOA-NASA.

Rainfall requirements for rain-fed rice cultivation are between 700 and 800 mm per cycle. For irrigated rice cultivation, estimates vary between 800 mm and 1,500 mm of water needed per cycle *[54]*, with a minimum of 1,600 mm for areas with two cropping cycles. Burundi's rainfall patterns at Figure 21, makes it easy to understand how important hydro-agricultural structures are in boosting production by enabling better annual distribution of water availability. However, annual rainfall seems to be just enough to ensure two or even three cropping cycles, which also explains why 19% of the 213 rice farmers interviewed consider the lack of rain to be a major risk - with a higher prevalence in the Provinces of Ruyigi (43%) and Karuzi (35%). In contrast, rice producers in the Provinces of Bujumbura Rural, Makamba, Kirundo and Ngozi seem not to be subject to losses caused by the water deficit.

4.4.2. Excess rainfall

Excess rainfall can cause major damage in Burundi, just as much as water deficits. **Heavy rainfall**, particularly during the two peak periods of December-January and March-April, can **cause siltation and violent erosion, which in rice cultivation can damage both plants and infrastructure (dikes, dykes, canals, dams, etc.)**. High rainfall patterns at harvest time also make the process of drying and preservation of rice complex. High rainfall patterns regularly cause mould and can delay hulling and marketing the new produce to players in the processing line, who need dry paddy rice for their business.

This risk affects not only rice producers, **but also stakeholders in the entire sector**, because it affects infrastructure, transport and rice quality.

As can be seen from the Figure 21, rainy seasons which exceed 1,300 mm cumulatively, and are likely to cause major damage to crops and infrastructures across the country, are becoming more frequent (possibly as a result of climate change).

4.5. Risks for Traders

Rice traders, whether they limit themselves to aggregating rice within production zones, or whether they participate in redistributing to shortage zones and in importing during periods of shortage on the national market, have a **relatively moderate exposure to risk** as compared to other actors in the sector.

Traders, who are highly diversified and generally stock up for periods limited to a few months and have extensive information-gathering networks to diversify their supply chains and retail outlets, can be described as **risk management professionals**.

However, they remain exposed, albeit moderately, to most of the risks affecting the sector, which create considerable variability in both business volumes and profit margins within and between years. The table below classifies the main risks faced by traders involved in the buying and selling of rice in Burundi.

[54] Source: LAGE and MOURID (1996), Water requirements and irrigation management methods for irrigated rice fields.

Retailers		Frequency	Intensity		Risk prioritization	
No	Risks	Frequency score (F)	Average impact score (Imoy	Maximum impact score (Imax	Final score: ((F*Imoy)*.75) + (Imax*0.25)	Comments
15	**Personnel illnesses and accidents**	**2**	**2**	**5**	**4,25**	Retailers often work as sole traders or with a small number of employees. Most of their know-how (networks of suppliers, customers, information, product knowledge, knowledge of logistics costs) is concentrated in them, making them highly exposed to personal risk.
14	**Difficulty in accessing foreign currency**	**1**	**3**	**4**	**3,25**	The majority of Burundian traders sell both locally produced rice and other dry grains (maize, beans, wheat, groundnut, soya), as well as a small amount of imported food commodities (notably perfumed rice). The amount of imported food commodities varies according to national production and the time of year. Difficulties in accessing foreign currency can further complicate the import of food commodities and access to these commodities, thereby reducing profit margins and business volumes for retailers.
1	**Water deficit**	**3**	**1**	**4**	**3,25**	Systemic weather risks affecting the production of an entire province, or even national production, can substantially reduce the business volume of rice traders. This is a major risk because it can also affect the availability of other dry grains sold by these traders (maize, beans, wheat, groundnut, soya, etc.). On the other hand, they can offset some of the fall in business volume by increasing unit profit margins on already accumulated stock.
2	**Excess rainfall**	**3**	**1**	**4**	**3,25**	
7	**Stock infestations**	**3**	**1**	**4**	**3,25**	Most traders use storage areas and treatments suitable for rice that limit this risk, although they may occasionally be affected by infestations that cause very significant losses.
5	**Insects**	**3**	**1**	**3**	**3,00**	The considerable damage that insects can cause to rice supplies may slightly affect business volumes for traders.
11	**Price drops**	**3**	**1**	**3**	**3,00**	The fall in prices can devalue stocks of traders and lead to losses. These losses are generally limited, as traders spread out their supplies and sales, and therefore only incur losses on a small portion of their business volume.
12	**Price increases**	**3**	**1**	**2**	**2.75**	Few traders work under contract, so they can take advantage of rising prices to increase the value of their stock. For the few traders who want to engage in contract sales (public procurement, WFP supply, catering, etc.), price increases after the contract has been signed can be a major risk, reducing or even negatively impacting the profit margin on these contracts.
6	**Rice diseases**	**2**	**1**	**2**	**2,00**	Idiosyncratic risks linked to production have a limited impact on the activity of traders, although they may have a moderate impact on the scale of their traditional supply chain and force them to travel further to find products and increasing their marketing costs.
10	**Difficulties in accessing inputs**	**2**	**1**	**2**	**2,00**	
8	**Thefts**	**1**	**1**	**5**	**2,00**	Theft of goods and money, although infrequent, can cause huge losses for traders when large amounts are involved.

Commerçants		Fréquence	Intensité		Risk prioritization	
9	Road accident	1	1	4	1.75	Road accidents are frequent in rural areas. Even though the majority of Burundi's rolling stock has low payloads (between 3 and 10 tons per truck), this limits the volumes subject to this risk. However, on an individual trader scale, losses can be significant when the entire shipment is destroyed.
13	Difficulty in accessing financing	1	1	3	1.50	Traders generally have privileged access to bank financing. For small-scale traders or traders with little collateral, however, the tightening of credit supply in times of economic, financial or political crisis can lead to a drop in cash flow and therefore a substantial drop in business volume.
3	Violent storms	1	1	2	1.25	Same as for diseases, but with even less impact.
4	Cold wave	1	1	2	1.25	
16	Machine breakdown					Not relevant, as traders rarely own machines. However, if traders integrate or move into rice processing activities, they become subject to these same risks as the manufacturers.
17	Power outages					

4.6. Risks for processors

Unlike maize processors, who do a lot of their own work, rice processors carry out a large proportion of their business as service providers (contract work), either for producers or for traders.

The biggest risk for them is **irregular access to electricity**, essential for running their huskers and other equipment. Machine breakdowns also have an impact but are easier to resolve.

Their activity is highly seasonal (work peaks at harvest time, with periods of low activity for the rest of the year) and is heavily dependent on the size of the harvest in the production area in which they work, as they only exceptionally buy paddy rice from outside their local area.

The risks associated with rice production (weather, pests, etc.) and price variations therefore have a major impact on them, reducing their seasonal volume of business. However, they are less affected by financing and price risks as compared to grain processors, given that a large part of their business as service providers is not tied to the value of rice.

Processors		Frequency	Intensity		Risk prioritization	
No	Risks	Frequency score (F)	Average impact score (Imoy	Maximum impact score (Imax	Final score: ((F*Imoy)*.75) + (Imax*0.25)	Comments
17	**Power outages**	3	3	5	8.00	The stability of the Burundian electricity network and power outages are a major risk for processors. The majority of processing units run on electricity and have no access to back-up generators (as imported fuels are very expensive). Network instability can lead to breakdowns and breakages in electric motors, while power outages cause frequent random interruptions to activity. All the processors we interviewed stressed that this has been the main risk they have faced since the start of their business.
1	**Water deficit**	3	3	5	8.00	Systemic weather risks affecting the production of an entire province, or even national production, can significantly reduce the business volume of rice processors, who generally depend highly on a single production area. Their capacity for alternative activity is very limited, and few processors are in a position to buy paddy rice far from their home area. These risks can therefore have a major impact on their business over the course of a season, or even an entire year.
2	**excess rainfall**	3	3	5	8.00	
12	**Price increases**	3	2	3	5.25	Rising rice prices can increase the working capital requirements of rice processors and reduce their competitiveness vis-à-vis imported rice. However, the majority of rice processors work on a contract basis, hulling rice either for producers or for rice traders. These reasons explain why the rise in rice prices only marginally affects their business.
5	**Insects**	3	2	3	5.25	The significant damage that insects can cause to rice supplies can substantially affect business volumes and the competitiveness of processors. However, it is rare for the damage caused to be sufficiently widespread to cause a drop in all production in a supply area, thereby reducing the intensity of the impact.
15	**Personnel illnesses and accidents**	2	2	5	4.25	The majority of processors are small companies with few employees. Company managers possess most of the company's know-how (networks of suppliers, customers, information, knowledge of the product, machines and quality) and are therefore highly exposed to personal risk.
6	**Rice diseases**	2	2	4	4.00	Production-related idiosyncratic risks have a limited impact on the activity of processors, even if they can have a moderate impact at the level of their supply chain and reduce business activity for an entire season.
10	**Difficulties in accessing inputs**	2	2	4	4.00	As in the case of weather risks, a drop in production in the supply area resulting from producers' difficulty in accessing inputs can lead to a significant drop in business for a rice processor.
16	**Machine breakdown**	3	1	5	3.50	Most processors work with medium-capacity Chinese huskers (SB50 models, called H50 in Burundi, with a capacity of 200 kg/h). The know-how and spare parts for repairing these machines are readily available. On the other hand, when processors or projects invest in more sophisticated equipment (such as the Chinese mini-rice plants built by the PRODEFI project), their exposure to breakdowns becomes a huge risk that can lead to the bankruptcy of the processing unit.

	Processors	Frequency	Intensity		Risk prioritization	
14	Difficulty in accessing foreign currency	1	3	4	3.25	Rice processors may be impacted by the lack of foreign currency, mainly for importing equipment and spare parts for their units. These impacts are however minimal, as many spare parts suppliers have their parts in stock on the national market.
7	Stock infestations	3	1	4	3.25	The majority of processors have storage areas and treatments adapted to rice that limit this risk. However, they are occasionally affected by infestations that cause very significant losses.
11	Price drops	3	1	3	3.00	Falling prices can devalue the stock of processors and lead to losses. However, these losses are generally limited, as processors spread out their supplies and sales, and therefore only incur losses on a small fraction of their business volume.
3	Violent storms	1	2	4	2.50	As in the case of disease, but with less frequency, violent storms and cold waves affecting a rice processor's supply area can cause a significant drop in business.
4	Cold wave	1	2	4	2.50	
8	Thefts	1	1	5	2.00	Theft of products, equipment, stock and money, although infrequent, can cause huge losses for processors when large amounts are involved.
9	Road accident	1	1	4	1.75	Processors rarely pay for the transport of paddy and white rice. When they do, however, and an accident occurs, it can mean very heavy losses for them.
13	Difficulty in accessing financing	1	1	3	1.50	Processors are sometimes dependent on access to finance for their paddy rice supplies, as well as for payment of their running costs (employees, rent, electricity). A reduction or increase in access to credit has a slight impact on their sales, but as a large part of their business is service-based, they can still remain active without bank financing.

4.7. Risks for distributors

Highly diversified (in dry grains or a wider range of staple products), with limited fixed costs and the ability to vary their supplies between domestic production and imported rice, retailers, like traders, benefit from moderate risk exposure and **appropriate risk management strategies**.

Like other retailers, however, they bear the **risks associated with rice storage**. Additionally, they are more affected by structural production downturns (weather risks) and price increases, which can prompt some consumers to buy directly from producers or processors, reducing their business volume.

Processors		Frequency	Intensity		Risk prioritization	
No	Risques					Comments
1	**Water deficit**	**3**	**1**	**3**	**3.00**	Systemic weather risks can marginally reduce the business volume of rice retailers by increasing the time spent distributing white rice and reducing daily sales. Retailers generally manage to supplement their supplies with imported rice if domestic production is disappointing, however, this greatly increases the retail price. Moreover, in periods of shortage, some low-income urban consumers try to obtain supplies directly from producers and processors or reduce their rice consumption in favour of tubers (which on average cost less per calorie), which can lead to a sharp drop in retail activity.
2	**Excess rainfall**	**3**	**1**	**3**	**.3.00**	
7		**3**	**1**	**3**	**.3.00**	The majority of retailers use storage areas and treatments adapted to rice, which limit this risk. However, they may occasionally be affected by infestations causing significant losses, although on small quantities of stock (rarely more than a few tonnes).
12	**Price increases**	**3**	**1**	**3**	**3.00**	Price hikes, when they drive some consumers away from their shops, can sharply reduce the volume of business for traders, while at the same time increasing the cost of their working capital (higher WCR for lower business volume).
5	**Insects**	**3**	**1**	**2**	**2.75**	The major damage that insects can cause to rice supplies may have a minor impact on the business volumes of retailers.
17	***Power outages***	**3**	**1**	**2**	**2.75**	Retailers generally buy from traders and sometimes directly from processors. A reduction in activity at neighbouring processors due to power outages may therefore have a minor impact on their business. Modern retailers (supermarkets, shops) are also affected by power outages for their lighting and the operation of their refrigerators, where they have them.
11		**3**	**1**	**2**	**2.75**	Price drops can devalue stocks of retailers and lead to losses. These losses are generally limited, as retailers' stock small volumes, especially in the period leading up to harvest when they anticipate the risk of falling prices.
15	***Worker illnesses and accidents***	**2**	**1**	**3**	**2.25**	Although retailers often work as sole traders or with a small number of employees, their business is relatively non-technical. They can easily call on a family member to run their shops in case of unavailability.
6	**Rice diseases**	**2**	**1**	**2**	**2.00**	Disease and input supply difficulties are mostly idiosyncratic risks. They have a limited impact on the business of distributors.
10	**Difficulties in accessing inputs**	**2**	**1**	**2**	**2.00**	
8	**Stock infestations**	**1**	**1**	**4**	**1.75**	Product and cash thefts, although infrequent, can cause significant losses for retailers when large amounts are involved.
13	**Price drops**	**1**	**1**	**4**	**1.75**	Distributors generally have privileged access to bank financing. However, in times of economic, financial or political crisis, the tightening of credit conditions and the rise in the cost of credit can lead to a reduction in the number of customers.

Distributors		Frequency	Intensity		Risk prioritization	
14	**Difficulty in accessing foreign currency**	**1**	**1**	**3**	**1.50**	Majority of Burundian retailers do not directly import the white rice or other dry grains they sell. The lack of foreign currency, however, when it affects traders who import dry grains during a period of local production shortage, can make it more difficult for them to obtain supplies, sharply increase the cost of raw materials and marginally reduce their business volume.
9	**Accident transport**	**1**	**1**	**3**	**1.50**	Retailers very rarely organize the transport of produce. They are mainly supplied directly by traders, and more rarely by processors, who take on the transport costs. Their exposure to this risk is therefore limited.
3	**Cold spell**	**1**	**1**	**2**	**12.5**	Severe thunderstorms and cold waves can reduce rice availability in a production area, but not at the national level, which explains why they have little effect on retailers.
4		**1**	**1**	**2**	**1.25**	Same as for storms and disease, but with even less impact.
16	**Machine breakdown**				**0.00**	Retailers are not affected by machine breakdowns, except when they are also processors.

4.8. Industry-wide risks

At the level of sector, weather, market, phytosanitary, personal and machinery risks clearly stand out as having the greatest impact. Producers and processors are the actors at greatest risk.

	Category	Risk	Input suppliers	Producers	Traders	Processors	Distributors	Value chain	
1	WEATHER	Low rainfall	3,3	10,3	3,3	8,0	3,0	5,6	MAJOR RISKS
2	WEATHER	Excessive rainfall	3,3	7,3	3,3	8,0	3,0	5,0	
11	MARKET	Price drop	7,8	7,8	3,0	3,0	2,8	4,9	
15	PERSONNEL	Illness and personal accidents	4,0	7,3	4,3	4,3	2,3	4,4	
10	MARKET	Access to inputs	5,8	7,3	2,0	4,0	2,0	4,2	
5	PHYTO	Insects	0,0	8,0	3,0	5,3	2,8	3,8	SIGNIFICANT RISKS
17	MACHINE	Power cuts	5,8	0,0	0,0	8,0	2,8	3,3	
6	PHYTO	Rice diseases	0,0	7,3	2,0	4,0	2,0	3,1	
7	LOGISTICS	Stock Infestation	0,0	5,8	3,3	3,3	3,0	3,1	
14	FINANCIAL	Access to foreign currency	4,3	1,3	3,3	3,3	1,5	2,7	AVERAGE RISKS
12	MARKET	Price Increase	0,0	2,3	2,8	5,3	3,0	2,7	
8	LOGISTICS	Theft	2,0	4,3	2,0	2,0	1,8	2,4	
3	WEATHER	Violent Storms	1,3	4,3	1,3	2,5	1,3	2,1	
4	WEATHER	Cold Wave	1,3	4,3	1,3	2,5	1,3	2,1	
13	FINANCIAL	Access to Finance	2,3	2,3	1,5	1,5	1,8	1,9	
9	LOGISTICS	Tranport accident	1,8	1,8	1,8	1,8	1,5	1,7	
16	MACHINE	Machine breakdoen	4,3	0,0	0,0	3,5	0,0	1,6	
		Average per actor	2,8	4,8	2,2	4,1	2,1		

Figure 22: Ranking of the main risks for actors and the entire rice value chain in Burundi (source: authors, based on PARM methodology)[55]

[55] N.B.: the score shown at the level of the value chain is the average of the scores for the five categories of actors. Ideally, this overall score should have been calculated based on a weighted average according to the importance (added value) of each category of actor: the lack of data on their volumes and economic performance prevented us from going into that level of detail. Furthermore, this average calculation by type of risk includes zero values for categories of actors for which there is no risk.

For educational purposes, here is an illustration of the major and important risks by category of actor:

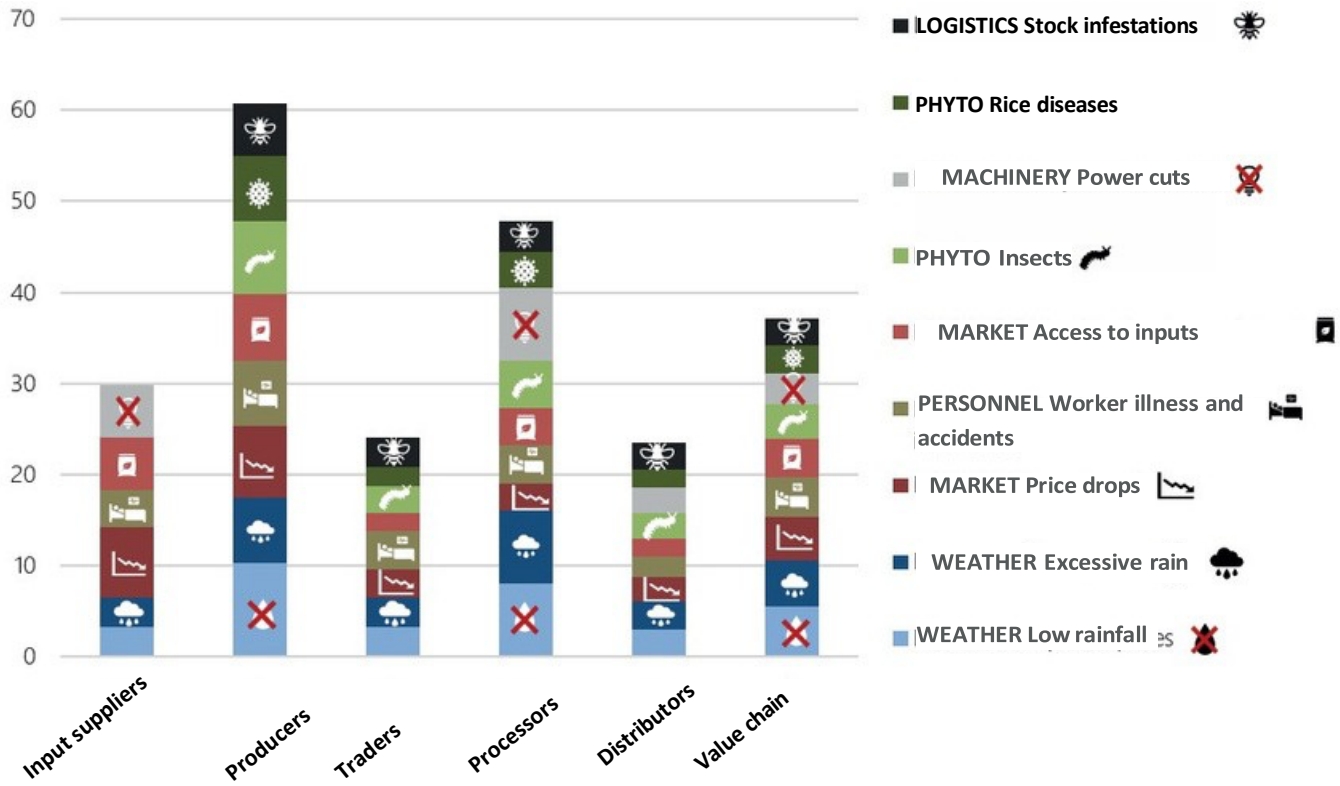

Figure 23: Graphic illustration of the main risks for each category of actor.

5_ Risk management capacity in the rice sector

5.1. Risk management capacity of actors

The main agricultural risk management strategy shared by all actors in the rice sector is **diversification**. All actors in the sector are involved in other agricultural sectors, and **only certain processors (huskers, mini rice plants) are structurally dependent on the rice sector for their business.**

5.1.1. Risk management tools for input suppliers

Input suppliers have no real risk management tools. Their first strategy is not to specialize in the supply of inputs linked to a single value chain, but to **diversify their offer**, including inputs for all agricultural production, but also sometimes veterinary inputs and often small equipment that can be used in agriculture as well as in construction or silviculture (tools, buckets, ropes, torches and electric lamps, etc.).

Faced with market and weather risks which, by affecting income of farmers, can affect their sales, many suppliers like Tubura (a subsidiary of the NGO One Acre Fund) are developing **sales on credit** (partial or total) with flexible repayment schedules, enabling farmers to spread input repayments according to harvests and sales of different crops. Thus, inputs used on rice in season A can sometimes be repaid, even before the rice harvest, with sales of animals, cassava chips, beans or vegetables.

5.1.2. Risk management tools for farmers

For farmers, diversification is achieved through two channels: crop diversification and diversification of activities.
As shown in the opposite figure, data from the 2023 AGVSAN Survey confirms that **70% of households have more than one source of income.**
In the surveys carried out, 12% of respondents said that in years when they had been hit by one or more risks, **they had resorted to borrowing** from their producer organization, traders or neighbours. 6% have managed to survive by working for other less-impacted producers and by engaging in non- agricultural activities (transport, construction, trade). It is important to note that beyond this **6%, many households are structurally** diversifying their activities, with the men (mainly) working in the non-agricultural sector.

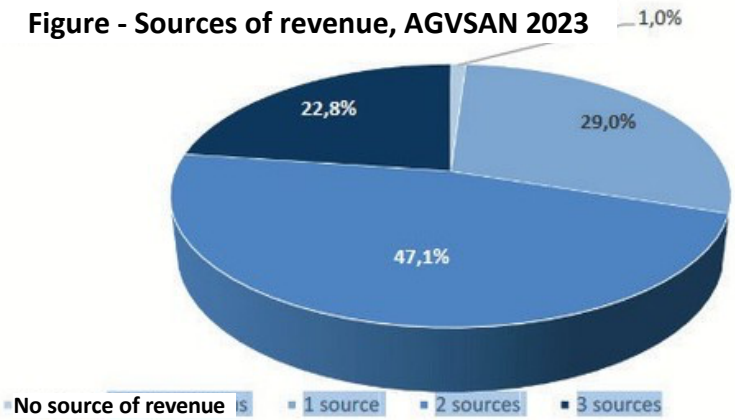

*Figure SEQ Figure * ARABIC 24: Number of sources of income for Burundian households (source: AGVSAN 2023)*

6% have diversified their crop, or livestock production, and **another 6% are selling more surplus** (rice or other) than planned (even if it means reducing their food intake, according to two respondents).

4% sold animals or other assets from their estate to compensate for the loss.

Faced with the risks impacting production, 8% consider that implementing **good agricultural practices** can protect them. **7% call on the technical services/agronomists** to find out what to do in the event of a problem, and 2% consult other rice farmers to work together to find a solution.

Finally, 2% report their problems (of all kinds) to the local authorities (mainly in Gitega province).

Index insurance pilot

Index micro-insurance based on rainfall records is still in the trial phase *[56]* in Burundi and could be scaled up once the evaluation of this experimental stage has been completed*[57].*

In principle, rainfall index micro-insurance is based on a threshold volume of cumulative rainfall recorded during an agricultural season on one or more plots containing several crops. The so-called normal rainfall used as a threshold is the rainfall forecast for the geographical area covered and supplied by the platform of experts from the countries of the Horn of Africa through the Geographic Institute of Burundi (IGEBU). If rainfall deviates upwards (excess rainfall) or downwards (deficit rainfall) *[58]*, a payment is made to compensate the victims calculated at 1% of the insured amount (insurance premium and insurance fund financed by the project) for each mm of rainfall deviation.

The level of intervention also depends on the level of agricultural investment declared by the insured, and in no case does compensation exceed 50% of the agricultural investment made by the insured. Micro-insurance is designed around community financial groups (CFGs) to promote financial inclusion, secure payments through digital platforms, reduce the transaction costs of collecting premiums and act as a channel for communicating good agricultural practices that can mitigate the impact of climatic shocks and thus prevent risky behaviour/moral hazard. At the end of this pilot season (2024 A), farmers had little confidence in the feasibility of the tool, and the insurance premium was therefore paid on a flat-rate basis rather than being correlated with the agricultural investments made on the farm.

If the Government and the TFPs contribute to the insurance fund, the substantial compensation can still mobilize agricultural producers around this agricultural risk management tool, and the insurance premium can also be partly covered by this same fund. Financial compensation could be improved by making calculations based on the rainfall required at each of the critical phases (emergence, bolting, flowering, etc.) according to the thresholds provided by research centres such as ISABU and UB, instead of the cumulative rainfall over an entire season *[59]*.

Lastly, in an irrigated area, water deficits and excesses affect plots differently depending on their position in relation to water distribution structures.

This raises the question of whether more complex tools that are better adapted to each area would be more appropriate than index insurance in the case of the rice sector. It would be particularly interesting to study the value of insurance or emergency funds for the works themselves in the event of damage, including covering the repair costs and compensation for producers who have lost access to irrigation for the duration of a season.

[56]Pluviometric index micro-insurance is being implemented in 2024 A in Gitega Province by the NGO CORDAID through its Support Project for the Development of Innovative Rural Finance (PADFIR) in Burundi, financed by the Kingdom of the Netherlands.

[57]See an extract from the social community micro-insurance approach initiated by the PADFIR project of the CORDAID NGO, as well as the report on the day devoted to reflection on index-based micro-insurance in Burundi, co-organised by CORDAID and ARCA.

[58]The rainfall recorded in the project area is assessed by means of pluviometric readings from rain gauges installed in each area over a 9 km radius.

[59] Some countries, such as Niger and Senegal, use rainfall indices divided into critical phases of crop production (Maichanou, 2017).

5.1.3. Risk management tools for traders

Just like input suppliers and farmers, traders primarily manage risk by **diversifying** their activities. This approach is based primarily on the marketing of a variety of dry food commodities (very few traders market highly perishable products such as fruit and vegetables in addition to dry grains).

For **large-scale traders**, who assume greater risks by financing, storing and transporting large quantities of grains, risk reduction is also achieved by **diversifying into real estate**. Owning residential properties and/or hotels has the advantage of offering both complementary sources of income (with little impact on agricultural risks) and providing a guarantee to the banking sector for obtaining working capital loans.

5.1.4. Risk management tools for processors

As mentioned above, processors have little capacity for diversification (as their huskers can only be used for rice hulling).

Contractual work is their best risk management tool.

By not having to bear the cost of acquiring the raw material (paddy) and marketing the finished product (white rice) and by-products (husk, bran), they significantly reduce their fixed costs and fixed assets. With this approach, rice processors greatly reduce the impact of price risks and risks of access to finance.

5.1.5. Risk management tools for retailers

Retailers are less exposed to risks in the rice sector than other actors because they are **highly diversified**, and their main strategy is to **enter contracts with their suppliers**. Whether oral or written (particularly in the case of modern distribution sites such as superettes and supermarkets), retailers require their suppliers to commit to stable **prices, quality**, containers, and volumes delivered over a specific period (month, quarter, year) and will select their suppliers according to their ability to meet this commitment.

These oral or written contracts enable retailers to **transfer part of the risk** to their suppliers (traders, processors or even farmers). This transfer strategy greatly reduces their exposure to risks in the rice sector.

5.1.6. Cash transfers: a cross-cutting but relatively limited risk management tool in Burundi

As Burundi is a sparsely urbanized country with a small diaspora, the actors in the rice value chain benefit little from external income (family working in town or expatriate). As can be seen below, less than 5% of people living in rural areas and less than 7% of those living in urban areas receive cash transfers to help them cope with agricultural risks affecting their income.

Transfers received by households during the past 12 months

Figure 25: Rate of access to cash transfers in Burundi (source: AGVSAN 2023)

5.2. Risk management capacity for companies

5.2.1. National risk management tools

The National Platform for Risk Prevention and Disaster Management

Created in 2007*[60]*, the National Platform for Risk Prevention and Disaster Management is under the Ministry of Interior, Community Development and Public Safety. Its mission is to identify and prevent the risk of natural disasters and to facilitate disaster response.

It works closely with UN agencies and NGOs specializing in crisis management, particularly the International Organization for Migration (IOM), which has helped develop a **multi-hazard mapping platform***[61]*, which displays provincial maps showing the risks associated with natural disasters (torrential rains, floods, violent winds, earthquakes, landslides, etc.) and quantifies average annual losses per townships (for Burundi's 119 townships).

The Platform has also developed **an action plan for 2013-2016** to build national capacities for risk reduction, emergency preparedness and response in Burundi [62]. The plan highlights the absence of funds for disaster management and the limited resources for Burundi's firefighters and teams from the Directorate General of Civil Protection.

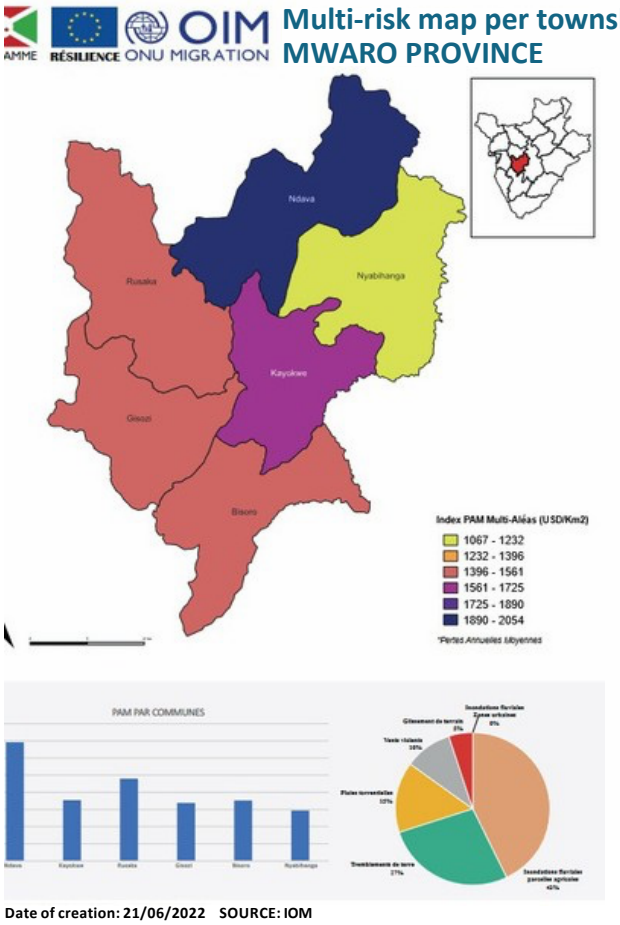

Figure 26. Example of an IOM multi-hazard map by townships (source: harmonized national contingency plan)

[60] https://bibliomines.org/wp-content/uploads/Decret_N___100-291_du_16_Octobre_2007.pdfand https://presidence.gov.bi/wp-content/uploads/2024/04/decret.pdf

[61] https://fscluster.org/sites/default/files/documents/cfsva_2023_burundi_rapport_final_version_francaise.pdf

With regard to agricultural risks, this action plan primarily emphasizes the importance of setting up an agricultural **Early Warning System (EWS)** to anticipate crises, particularly food crises, within a multi-risk EWS.

The recent media appearance (in February 2024) by the Platform's Chairperson, Mr Anicet Nibaruta *[63]*, indicates that neither the EWS nor the Fund has been established yet.

Over the next few years, the National Platform for Risk Prevention and Disaster Management intends to **invest in Burundi's weather forecasting capacity**.

The World Food program Mission in Burundi

Created in 1961, the World Food Program (WFP) has been present in Burundi since the 1990s, providing food aid to displaced persons and refugees during the civil wars and crises that have marked the period. Currently, the WFP is involved in **distributing food aid to the tens of thousands of refugees** (mainly Congolese) living in Burundi, but also in **programs to combat malnutrition** among young children and schoolchildren.

In terms of data collection, the WFP regularly supports the National Institute of Statistics of Burundi (INSBU) and the Ministry of Agriculture in carrying out **surveys on rural household vulnerability and food security**. It particularly financed a Global Analysis of Vulnerability, Food Security and Nutrition in Burundi in August-September 2023 (AGSVAN 2023) *[64]*. WFP and INSBU are also monitoring the retail prices of the main food commodities (maize, beans, cassava flour, potatoes) in the retail markets of Burundi's major towns. However, they do not track changes in the unofficial exchange rate on the parallel market, which clearly skews their analyses of price trends when there is a 60% gap between the official foreign exchange market and the parallel market.

National contingency plan

A national contingency plan was developed in 2013-2014 *[65]*. This plan establishes **human risks** (internal conflicts and external migratory flows) as the **primary risks for the country**. Among the agricultural risks identified, **price risk (soaring prices) is ranked second** in terms of overall risks at the national level. Risks related to excess water (flooding, landslides, crop destruction) are ranked fifth and droughts eighth out of a total of 14 major risks identified.

A coordination mechanism, which places the National Platform for Risk Prevention and Disaster Management at the head of operations, is established as shown below:

[62] https://www.cadri.net/system/files/2021-05/BURUNDI-Plan-d-Action-National-en-RRC.pdf

[63] https://www.iwacu-burundi.org/changement-climatique-au-burundi-vers-un-systeme-dalerte-precoce-pour-tous/

[64] https://fscluster.org/sites/default/files/documents/cfsva_2023_burundi_rapport_final_version_francaise.pdf

[65] http://www.presidence.gov.bi/wp-content/uploads/2017/04/plan-de-contingence-nationale-de-gestion-des-urgences.pdf

GENERAL COORDINATION AND MANAGEMENT MECHANISMS

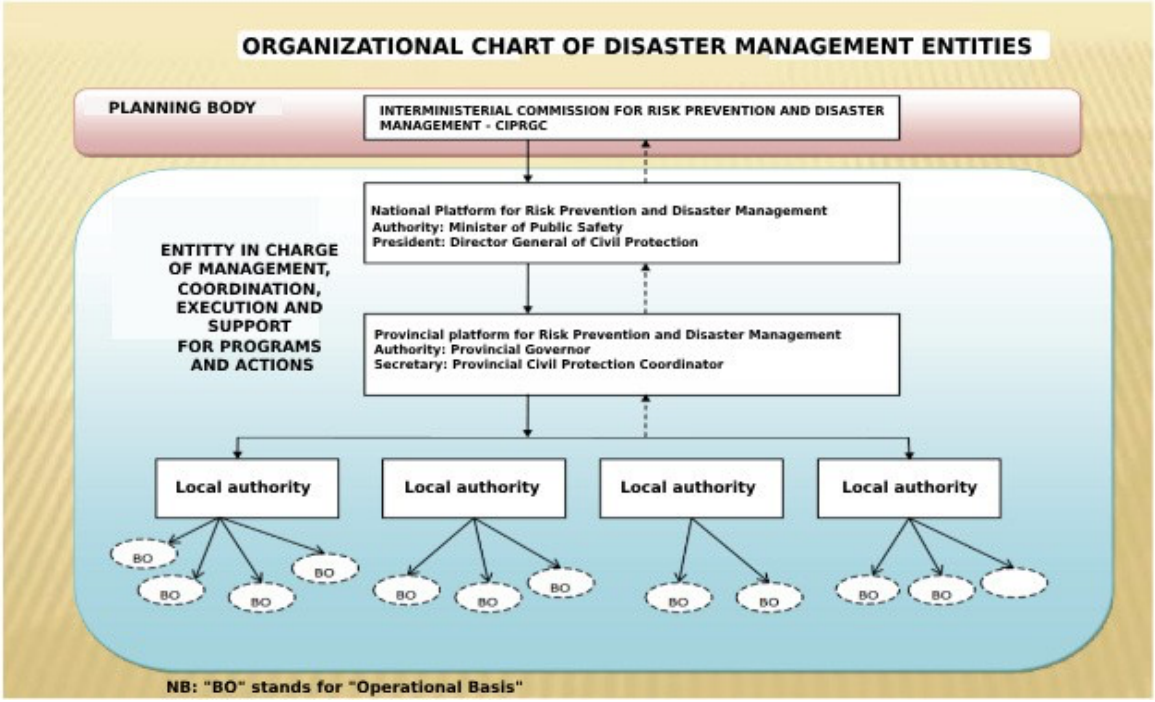

Figure 27: National coordination institutional structure (source: harmonized national contingency plan)

Disaster management therefore seems to be relatively well organised in Burundi, with dedicated institutions and monitoring tools that are constantly being improved. The State's main **challenge is the lack of a fund dedicated specifically to disaster management**. Against a backdrop of very limited public budget capacity and a lack of foreign currency, **the financing of action plans is currently highly dependent on international funding.**

ANAGESSA

ANAGESSA is an agency with a dual political mandate:

- **Build up food security stocks** throughout the country to prevent the risk of food crises and soaring commodity prices.
- **Support the selling prices of farmers** by buying at an incentive price.

To date, its scope of activity is limited to maize, however, there are plans to **include rice in the future**.

With three permanent employees, little experience and documentation in the regulation of agricultural markets and a highly critical approach to the current functioning of the markets (grain traders are considered by ANAGESSA staff to be speculators and usurers), the agency clearly appears to be **financially and technically under-equipped to carry out its mission**. Its short-term priority is to carry out an inventory of state and local government storage capacity, in order to establish its storage capacity and the improvements it needs to make.

It would also be highly strategic to provide its teams with **training in the workings of grain markets, the self-regulating role of private storage in normal conditions, and strategies for fine-tuning market regulation**. ANAGESSA's intervention in 2023, with a maize purchase price of BIF 1,700/kg (at a time when farm prices were around BIF 1,000/kg), was perceived as disruptive or unfair by many actors

In the sector. The risk of discrimination between suppliers also seems significant at such a price level, if no raw material acquisition rules are put in place (quota per farmer or farmer organization, tracking of stocks, rigorous quality control, etc.).

In the medium term, given the fragile state of Burundi's public finances, **the constitution and management of the grain fund and stock must also be subjected to economic modelling** in order to give the structure some financial flexibility to regulate the long-term supply of grain on the markets. For example, a "seasonally-allocated margin" system could make it possible to set up a fund, based on the average seasonal price trend, to which a storage margin would be added in regular years, making it possible to buy and sell at a loss in years when the grain market is under severe pressure (marked overproduction or underproduction). Coordination with the World Food Program also seems essential for the smooth running of the Agency.

5.2.2. Risk management tools for townships

Local contingency plans

GIZ *[66]*, the United Nations Development program (UNDP)*[67]* and the Ministry of Public Security have assisted some townships in Burundi to develop communal contingency plans. According to the Provincial Governors, some townships already have such plans. Once again, decision-making frameworks and responsibilities at the communal level seem to be clearly defined in these plans. Endowments, funds and means of action, however, appear to be much more limited.

It should be noted that in the communal contingency plans consulted, **food insecurity** emerges as a **major risk, along with climate events** (excess water, drought) which impact both agriculture and infrastructure.

5.3. Capacity and vulnerability

5.3.1. Risk management options and assessment of capacity

For each of the risks identified in the rice sector, a specific management option is analyzed. In addition to specific options, cross-cutting options such as diversification, which addresses several risks, are also analyzed. The analysis of options is based on two estimates:

- **Effectiveness** is an analysis of the option in terms of reducing the impact of the risk when implemented. It is scored from 1 to 3, according to the methodology presented below.
- **Applicability** is an analysis of the conditions of access to this option. If its access is extremely limited for reasons of cost, technicality of implementation or availability along the value chain, the score is low. If, on the other hand, access to this option is simple and common in the sector, the score is high. This score is established on a basis of 1 to 4, according to the methodology presented below.

66 https://adelphi.de/en/search?s=contingence+burundi

67 https://www.undp.org/fr/burundi/actualites/des-plans-de-contingence-communaux-actualises-pour-des-communautes-plus-resilientes-aux-catastrophes

68 http://mininterinfos.gov.bi/wp-content/uploads/2020/01/KQU@-MSPGC2020.pdf

Effectiveness of risk management option			**Applicability** of risk management options		
Category	Criteria	Score	Category	Criteria	Score
Significant effect	Reduction or compensation of at least 50% of losses	3	Applicable	General or common access to this option	4
Moderate effect	Reduction or compensation of at least 25% of losses	2	Sometimes applicable	Access to this option for more than half the group of actors	3
			Difficult or costly to apply	Access is limited to a few actors due to high cost or high technicality	2
Minor effect	Reduction or compensation of less than 25% of losses	1	Not applicable or very difficult to apply	Unavailability of the option within the sector or prohibitive cost	1

Figure 28: Methodology for quantifying PARM's risk management capacity

It should be noted that risk management capacity is **analyzed at the level of all sectors**. Within each category of actors, some more vulnerable groups such as women, young people, internally displaced persons (IDPs) or refugees, or newly established businesses, may have a much lower risk management capacity than the majority of actors in each stage of the supply chain. We will come back to the need for **specific approaches for these more vulnerable actors** within each sector in the action plan.

In the table below, we have analyzed the effectiveness and applicability of 37 risk management options (tools, strategies, public policies) in the Burundi rice value chain. Each option reduces or offsets one or more risks. Some options do not apply to all actors: in this case, no score is associated with the actor category.

As can be seen, input suppliers, retailers and traders have the best risk management capacity.

Although **farmers and processors** are the actors **most exposed to risk**, as we saw in the previous section, they are also the links in the value chain with the **most limited average risk management capacity**.

N°	Options		Risks	Input suppliers			Maize farmers			Traders			Processors			Distributors		
				Effectiveness (1-3)	Applicability (1-4)	Capacity (1-12)	Effectiveness (1-3)	Applicability (1-4)	Capacity (1-12)	Effectiveness (1-3)	Applicability (1-4)	Capacity (1-12)	Effectiveness (1-3)	Applicability (1-4)	Capacity (1-12)	Effectiveness (1-3)	Applicability (1-4)	Capacity (1-12)
1	Diversity of variety	124	Water deficit, excess rainfall, cold spells	2	3	6	2	2	4									
2	Supplementary irrigation	12	Water deficit				3	3	9									
3	Hydro-agricultural micro dev. mgt. plan	12	Water deficit, excess rainfall				2	2	4									
4	Watershed management plan	12	Water deficit, excess rainfall				2	2	4									
5	Natural disaster management fund	1234	Water deficit, excess rainfall, cold spells	2	1	2	2	1	2	2	1	2	2	1	2	2	1	2
6	Agroforestry	1234	Water deficit, excess rainfall, maize diseases	1	2	2	1	2	2	1	2	2	1	2	2	1	2	2
7	Agrometeorological info & advice	1234	Water deficit, excess rainfall, maize diseases				2	1	2									
8	Weather index insurance	1234	Water deficit, excess rainfall, maize diseases				2	2	4									
9	Info & advice on pests & diseases	56	Caterpillars, maize diseases				2	4	8									
10	Mechanical control techniques	5610	Caterpillars, maize diseases				2	3	6									
11	Chemical control techniques	56	Caterpillars, maize diseases				2	2	4									
12	Biological control techniques	5610	Caterpillars, maize diseases				1	2	2	1	2	2	1	2	2	1	2	2
13	Health monitoring system	5610	Caterpillars, maize diseases	2	3	6	2	2	4									
14	Self-produced fertilizers	10	Maize diseases, access to inputs				2	2	4									
15	Self-prod. phytosanitary treatment	101112	Maize diseases, access to inputs	2	4	8	2	2	4									
16	Self-produced fertilizers	101112	Access to inputs	2	2	4	2	1	2	2	3	6	2	2	4	2	2	4
17	Market information and advice	101112	Access to inputs, price drops, price increase	2	3	6	2	3	6	2	4	8	2	3	6	2	3	6
18	Reference market network	7812	Access to inputs, price drops, price increase							3	3	9	3	4	12			
19	Warrantage & third-party holding	7	Price drops, price increase, access to funding	2	2	4	2	2	4	2	2	4	2	2	4	2	2	4
20	Packaging adapted to maize storage	7	Stock infestation	3	4	12	3	2	6	3	3	9	3	3	9	3	3	9
21	Maize storage treatment	710	Stock infestation	3	4	12	3	2	6	3	4	12	3	4	12	3	4	12
22	Maize storage treatment	7812	Access to inputs, stock infestation				2	2	4									
23	Suitable storage warehouses	71012	Access to inputs, stock infestation	2	4	8	2	2	4	2	3	6	2	3	6	2	3	6
24	Grain banks	1112	Price drops, price increase, stock infestation				2	2	4									
25	Public price smoothing mechanism	1112	Price drops, price increase	2	1	2	2	1	2	2	1	2	2	1	2	2	1	2
26	Storage insurance (theft, dest.)	78	Stock infestation, thefts	3	2	6	3	2	6	3	2	6	3	2	6	3	3	9
27	Transport ins. (theft & destruction)	9	Diseases and transport accidents	3	2	6	3	2	6	3	2	6	3	2	6	3	2	6
28	Storage insurance (theft, dest.)	15	Diseases and personal accidents	3	2	6	3	1	3	3	1	3	3	1	3	3	2	6
29	Social security	15	Diseases and work accidents	3	3	9	3	1	3	3	1	3	3	1	3	3	2	6
30	Repair and spare parts network	16	Machine breakdown	3	3	9							3	3	9			
31	Supplier warranties	16	Machine breakdown	3	2	6							3	2	6			
32	Autonomous solar kit	17	Power cuts	3	2	6				3	2	6	3	2	6	3	2	6
33	Micro-credit and credit	All		3	4	12	2	3	6	2	4	8	2	4	8	2	4	8
34	Secure, liquid, interest-bearing savings	All		3	4	12	2	2	4	2	4	8	2	4	8	2	4	8
35	Value chain diversification	All		2	4	8	2	4	8	3	4	12	2	2	4	3	4	12
36	Diversification of activities	All		2	2	4	2	4	8	3	3	9	2	2	4	3	4	12
37	Safety net for the most vulnerable	All		2	1	2	2	1	2	2	1	2	2	1	2	2	1	2
	Average capacity by actor					6,8			4,5			6,0			5,5			6,2

Once the risk management capacity has been defined for each risk management option, the risk management capacity per risk is calculated on the basis of the average of the scores of all the options concerning the same risk. The result is a risk management capacity score out of 12, shown below. Risks which do not affect a particular actor are left empty. For this indicator, the lower the score, the more the ability to manage the identified risk is limited. Once again, farmers and processors have the most limited risk management capacity.

Risk management capability

			Input suppliers	Producers	Traders	Processors	Distributors
1	WEATHER	Lack of rainfall	6,0	4,6	6,1	4,3	6,6
2	WEATHER	Excess rainfall	6,0	4,6	6,1	4,3	6,6
3	WEATHER	Severe thunderstorms	6,0	4,3	6,1	4,3	6,6
4	WEATHER	Cold spell	6,0	4,2	6,1	4,3	6,6
5	PHYTO	Insects		5,0	6,8	4,7	7,3
6	PHYTO	maize diseases		5,0	6,8	4,7	7,3
7	LOGISTICS	Stock infestation		5,2	7,6	6,8	8,2
8	LOGISTICS	Theft	7,0	5,3	6,9	6,0	7,6
9	LOGISTICS	Transport accident	7,3	5,7	7,5	5,3	8,0
10	MARKET	Access to inputs	6,9	5,0	7,8	6,0	7,4
11	MARKET	Price drop	6,3	4,8	7,1	5,6	6,8
12	MARKET	Price rise		4,5	6,9	6,0	6,4
13	FINANCIAL	Access to finances	7,6	5,6	7,8	6,3	8,4
14	FINANCIAL	Access to foreign currency	7,6	5,6	7,8	5,2	8,4
15	PERSONNEL	Worker illness and accidents	7,6	4,9	6,4	4,6	7,7
16	MACHINE	Machine breakdown	7,6			5,9	
17	MACHINE	Power failure	7,3			5,3	8,0
		Average per actor	6,9	4,9	6,9	5,3	7,4

Figure 29: Risk management capacity of each player in the rice value chain (source: authors, based on PARM methodology)

On the basis of these risk management capacity scores, we can, in the following section, calculate the vulnerability score of each actor and the entire value chain to each risk.

5.3.2. Vulnerability score

The vulnerability score is calculated based on the **risk score weighted at 60%** and the **management capacity score weighted at 40%**. A moderate risk for which one category of actor has no management capacity may therefore result in greater vulnerability than a high risk for which the actors have significant management capacity.

In the rice value chain in Burundi, the two rainfall-related risks remain those to which the sector is most vulnerable. However, the sector's vulnerability to power cuts and rice pests is greater than its vulnerability to personal risks. This result is logical, given that players upstream (input suppliers) and downstream (traders, retailers) in the sector have a better capacity to manage personal risk (health and accident insurance, social security, savings and capacity to replace incapacitated staff), while their capacity to manage production risk (which influences their own activity) and electricity supply is extremely limited.

Rice Sector Vulnerability scores			Input suppliers	Producers	Traders	Processors	Distributors	Value chain	
1	WEATHER	Low rainfall	4,4	9,1	4,3	7,9	4,0	5,9	HIGH VULNERABILITY
2	WEATHER	Excessive rainfall	4,4	7,3	4,3	7,9	4,0	5,6	
17	MACHINE	Power cuts	5,3			7,5	3,3	5,3	
11	MARKET	Price drops	7,0	7,6	3,8	4,4	3,8	5,3	
5	PHYTO	Insects		7,6	3,9	6,1	3,5	5,3	
15	PERSONNEL	Illness and personal injury	4,2	7,2	4,8	5,5	3,1	4,9	
6	PHYTO	Rice diseases		7,2	3,3	5,3	3,1	4,7	
10	MARKET	Access to inputs	5,5	7,2	2,9	4,8	3,0	4,7	
16	MACHINE	Machine breakdown	4,3			4,6		4,4	
12	MARKET	Price increases		4,3	3,7	5,6	4,0	4,4	
7	LOGISTICS	Stock infestation		6,2	3,7	4,0	3,3	4,3	
4	WEATHER	Cold wave	3,2	5,7	3,1	4,6	2,9	3,9	SIGNIFICANT VULNERABILITY
3	WEATHER	Severe storms	3,2	5,7	3,1	4,6	2,9	3,9	
14	FINANCIAL	Access to foreign currency	4,3	3,3	3,6	4,7	2,3	3,7	
8	LOGISTICS	Theft	3,2	5,3	3,3	3,6	2,8	3,6	
9	LOGISTICS	Transport accident	2,9	3,6	2,9	3,7	2,5	3,1	AVERAGE VULNERABILITY
13	FINANCIER	Access to finance	3,1	3,9	2,6	3,2	2,5	3,1	
		Average by actor	4,2	6,1	3,5	5,2	3,2		

Figure 30: Vulnerability of actors and the entire rice value chain in Burundi to major risks (source: authors, based on PARM methodology)[69]

In conclusion, it can be noted that the categories of risk to which the sector is most vulnerable are those relating to water, the market, insects and power supply.

Personal risk is also very important for the most vulnerable actors and for the entire value chain but will be more difficult to influence within the framework of an agricultural risk management program, as it goes beyond the agricultural context and concerns the entire health and social security system.

In the following section, we will attempt to propose courses of action for the design of an agricultural risk management program capable of reducing the long-term vulnerability of actors and the sector to these major risks.

[69] N.B.: the score shown at the level of the value chain is the average of the scores for the five categories of actors. Ideally, this overall score should have been calculated based on a weighted average according to the importance (added value) of each category of actor: the lack of data on their volumes and economic performance prevented us from going into that level of detail. Moreover, this average score per vulnerability does not take into account actors considered not to be vulnerable to this risk.

For educational purposes, here is an illustration of the risks for which the various players are most vulnerable:

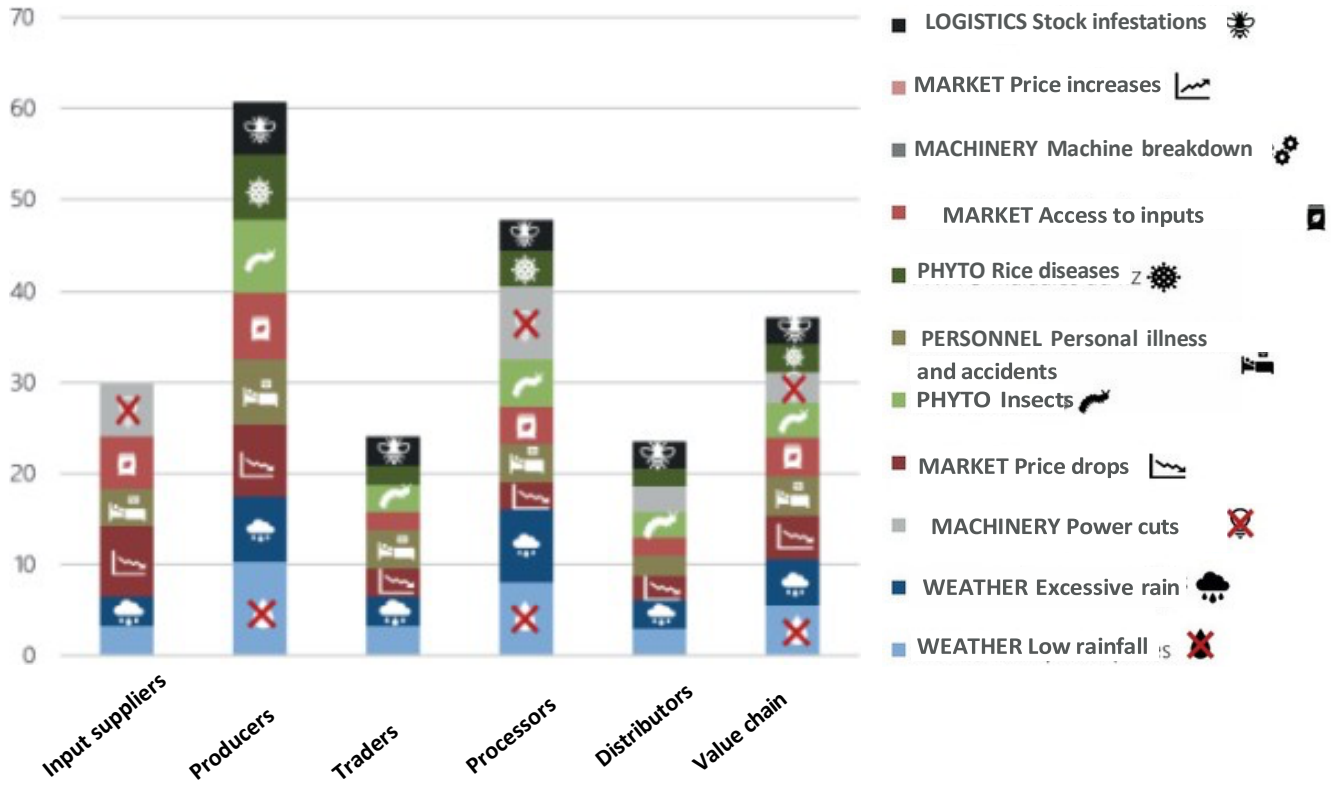

Figure 31: Graphic illustration of the risks to which actors in the rice value chain are most vulnerable

6_ Strategies and action plan for agricultural risk management in Burundi's rice value chain

The rice sector is highly exposed to risk. **This sector has experienced considerable growth since 2018, and is very important for Burundi's food security However, the risks associated with production in this sector are mainly environmental** (weather and phytosanitary pressures).

Existing mitigation strategies are mainly and intrinsically linked to Burundi's specific production methods: **crop diversity, use of topography to desynchronize production.**

The main risk categories identified by the study are as follows:

1. **production risks**: these relate both to extreme climatic events (particularly linked to water management) and to shocks from phytosanitary pressure.
2. **market risks**: these relate both to price volatility in production zones and on the national market, and to the impact of international markets via fertilizer imports.
3. **machine risks**: linked to the automation of input preparation and packaging stages, especially rice processing stages (sorting, hulling, milling, packaging). These risks, particularly the stability of power supply and, to a lesser extent, the availability of equipment, agro-industrial mechanical skills and spare parts, handicap the income and performance of upstream and downstream rice production and hinder the creation of added value in the sector.

It should be noted that beyond these risks linked to the rice value chain in Burundi, there are also **structural constraints for the country's agricultural economy**: densely populated and landlocked, Burundi has few comparative advantages and any specialization in one sector would be insufficient to ensure any kind of competitiveness on world markets (and would also be very detrimental to the resilience of the production system). On the one hand, the State's limited capacity to invest in its infrastructure and institutions (education, police, justice, rule of law, social security) and, on the other, the low level of diversification in the Burundian economy, severely limit the diversification options available to sector players (sectoral or non-agricultural diversification). It is difficult to address this third category of risk within an Agricultural Risk Management (ARM) program, which is why most of the proposals that follow will focus on the categories of risk that specifically concern the rice value chain.

However, a number of actions, notably concerning the functioning of markets and improving the production and dissemination of independent information useful to actors, contribute indirectly to strengthening the structure of the Burundian economy and thus contribute marginally to reducing these structural risks. Also, thanks to an Agricultural Risk Management program, the development of the maize, rice and rabbit sectors will contribute to the diversification of the agricultural economy and, more generally, the Burundian economy.

The image below summarizes the main action strategies proposed as part of an agricultural risk management program for the rice sector. Some of the proposed actions are similar to those proposed for the maize sector, as they are also highly relevant to the latter.

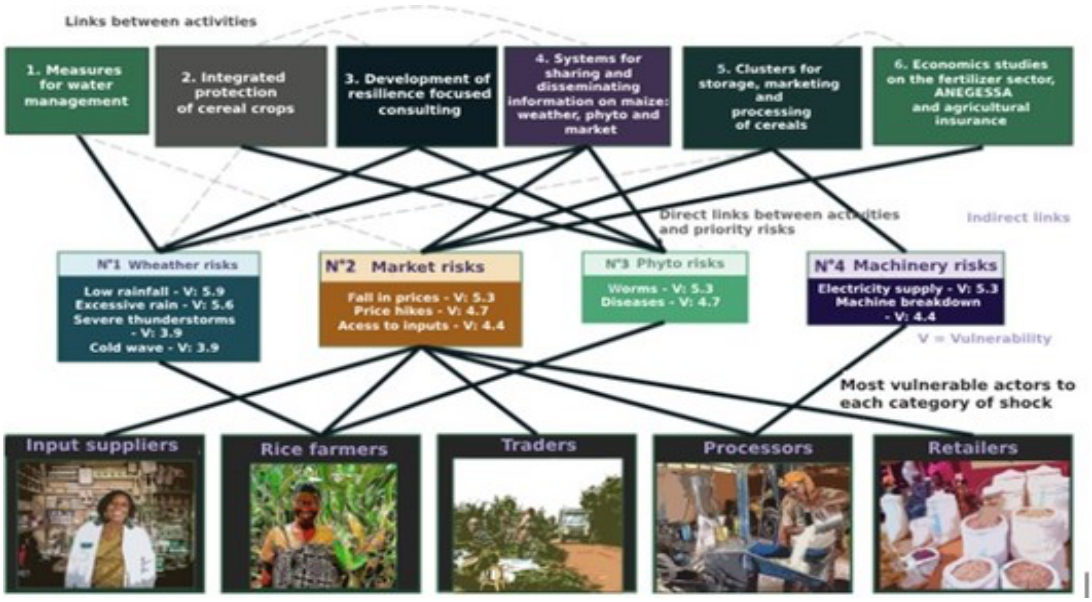

Figure 32: Proposed actions to manage priority agricultural risks in Burundi's rice sector

6.1. Collective water management of irrigated perimeters and watersheds

According to the surveys carried out during this study, the main climatic risks are the lack of water and, conversely, the damage caused by excess water (flooding, erosion, causing silting and damaging or even destroying agricultural, logistical and hydro-agricultural facilities).

Under IFAD's PRODEFI program, **7,619 hectares of marshland will be developed through hydro-agricultural structures** between 2016 and 2021. Over the same period, ENABEL, through its program d'Appui Institutionnel et Opérationnel au Secteur Agricole - PAIOSA (Institutional and Operational Support program for the Agricultural Sector), has also enabled the development of 3,200 hectares **over the same period**. Other technical and financial partners have contributed to the construction of such structures. These structures have enabled a significant increase in rice production, particularly in season A, which was previously not conducive to the flood-recession rice farming that had been the mainstay of the area.

Although a further increase in the number of developed areas remains a strategic objective for the advancement of rice production in Burundi, the analysis of agricultural risks shows that a challenge also lies in the collective management of water in these areas, both at the level of each irrigated area and at the level of a catchment basin, where several irrigated areas share the same water resources.

Moreover, a joint water management approach also makes it possible to implement good farming practices (promoted by the SRI System of Rice Intensification approach, among others) that help to preserve water resources and limit methane emissions, which are inherent in flooded rice cultivation and can be greatly reduced by alternating flooding and drying out during a cycle.

6.1.1. Collective water management in irrigated perimeters

Collective management of an irrigated agricultural area refers to the organization and coordination of irrigation activities by a group of farmers/users on a given perimeter, in partnership with the local authorities involved. Their common objectives are:

- Introduce volumetric and rational management of water withdrawals for irrigation
- Equitable distribution of available water volumes among irrigators
- Plan and coordinate crop calendars and water turns

Collective decision-making by irrigators involves several aspects: collective decisions on irrigation levels, decisions on the amount of user contributions and the use of funds *[70]*, upkeep and maintenance of installations.

Given that the facilities are fairly recent, this collective dynamic and the transfer of responsibility for the proper operation of the facilities to the users are yet to be structured. The collaboration, scope of responsibilities and financial involvement between rice-farmer organizations, other users of the perimeter and local authorities need to be clarified. In light of its experience in two provinces in particular, with the establishment of user associations paying a fee for the maintenance of facilities, ENABEL is currently working with the government on regulations for delegating the operational management of hydro-agricultural facilities to users.

Additionally, water management mechanisms within a perimeter create inequalities in having access to water when the flow of water supplies is insufficient. It is therefore necessary to strengthen and introduce innovative water governance mechanisms within these areas in order to optimize their management in the face of climate risks.

This activity falls within the scope of social engineering, and governance methods, financing and water management must be the focus of joint development with the beneficiaries, capitalizing on the most successful experiences in sub-Saharan Africa. Collective and individual insurance mechanisms could complement the governance and financing arrangements for irrigated perimeters.

6.1.2. Collective management of water and landscape in a watershed

A watershed may contain several irrigated perimeters sharing interconnected water resources. To avoid competition for access to water in years of scarcity, but also to prevent flooding and limit damage to infrastructure in years of heavy and concentrated rainfall. Above all, planning, governance, and development are needed in watersheds to reduce weather risks to hydro-agricultural facilities.

Beyond these aspects, a shared vision of the landscape is also possible in watersheds, with the introduction of various “agroecological techniques” that will enable better management of rainfall resources. It’s a painstaking and meticulous task, however, it could be carried out on a pilot basis using hills that have already completed their risk analysis and land use plans.

At the end of such consultations, a three-level action plan could be co-established, answering the following questions:

[70] The funds for the hydro-agricultural works were provided by the TFPs, therefore there is no question of repaying an initial loan.

- **On farms:** what practices should be implemented to protect the soil and absorb excess water: plant cover on bunds and around perimeters, service plants, mulching, short and long rotations, rice, fish farming and animal husbandry?
- **In watersheds**: what infrastructure is needed to store and evacuate water? What kind of social organization is needed to keep infrastructures functional?

In this context, a comprehensive approach to improving landscape resilience to rainfall is required. This global approach is designed to increase water storage capacity in watersheds (including in the "living" compartments of landscapes: forests, hedges, fodder), reinforce soil retention capacities and preserve their resistance to erosion, improve the capacity to evacuate excess water without damaging hydraulic systems, and, lastly, to strengthen the ability of households to better manage the soil/water resource pair (and promote best practices).

This watershed-based approach will need to take into account the problems of storing and evacuating excess water from the hillsides to the plains, including the high marsh areas. Such a hydro-geographical approach, which will involve major study and consultation phases before leading to development plans, would make it possible to mitigate risks on rice-farming perimeters while promoting good water management upstream in the watersheds.

For this reason, we propose that as part of the agricultural risk management program, activities to strengthen resilience to climatic hazards should be implemented in a complementary manner between hillside maize-growing areas and lowland rice-growing areas.

6.2. Promote integrated protection to limit phytosanitary risks

The second risk identified by farmers during the survey was **insect attack**. During field visits, the same concern was voiced repeatedly, seemingly aggravated by the impact of climate change. In fact, certain "new" insect pests (and therefore of particular concern to farmers), such as whiteflies observed in the Imbo plain, are clearly associated with rising temperatures. In this context, risk management must be both preventive and curative.

6.2.1. Supporting farmers in implementing preventive pest management

To achieve this, action should be taken on:

- *Growing conditions for rice* (and maize). Agroecological techniques are designed to promote good growing conditions for plants, making them more resistant to attack. This involves a range of techniques: varietal adaptation, rotation in time and space, and adapted mineral nutrition. Once again, many techniques are already implemented by farmers, and the aim of technical support is to enrich these methods and widen the range of available methods (for example, by increasing varietal availability or access to service plants).
- *Maintaining ecosystem regulation capacities.* The aim is to limit pest populations by maintaining a good level of regulators (natural predators: birds, bats, arachnids, insects, parasitoids). The conditions for adopting innovative preventive control methods need to be understood on a case-by-case basis (and require appropriate training for technical advisors, both in terms of the support they provide and the agronomic principles they apply).

Regulating capacity can be enhanced by setting up agroecological infrastructures: grass/flower strips, hedges, integration of trees into the landscape (trees and crops on bunds are very rare in Burundian irrigated perimeters), with the aim of increasing plant diversity (intra- and inter- specific).

6.2.2. Support farmers in curative control

In order to implement solutions to mitigate phytosanitary risks, it is sometimes necessary to resort to **curative control**. To achieve this, two actions can be implemented:

- Setting up *a crop health monitoring network*. Given the diversity of crops cultivated, it can be complex and costly to set up an active monitoring network. It would therefore be necessary to assess the current information-gathering systems active in Burundi, as well as the technical and financial partners, to see what synergies could be envisaged. Depending on the available networks, a simple, lightweight survey system (including WhatsApp photo exchange groups to improve identification) could be established.
- *Technical support for farmers in implementing curative solutions*. To achieve this, training in best practices for pesticide use would be very useful. There are several guides that could be used as a basis for this training (FAO guides among others), and a module on good practice in pesticide use could be developed through PARM's network of academic experts. A pilot test can be set up in collaboration with farmers' organizations and rural training centers.

6.2.3. Promote a landscape approach to health risk management

As in the case of climate risk management, a **landscape approach to health risk management** would reinforce the effectiveness of measures taken by farmers.

Such an approach would apply to all the three levels mentioned above:

- Managing health risks on farms: varietal mixes, push-pull techniques, adapted rotations, etc.
- Managing health risks on farms: enriching the farming system (diversity), agro-sylvo-pastoral integration. One of the challenges may also be to maintain the attractiveness of crops that have agroecological benefits and are more resilient to climate change. For example, the biomass production enabled by bananas and their protective effect on soils is essential. Similarly, sorghum is more resilient to heat deficits. These two crops seem to be declining in Burundi's overall crop rotation, and maintaining their attractiveness is one of the strategies for mitigating risk. To achieve this, it may be necessary to think "outside the agricultural sector", through agri-food development, to help maintain these crops in the landscape *[71].*
- Managing health risks in watersheds: agroecological infrastructure (hedges, forestry plots), grass strips, maintaining semi-natural environments.

[71] In this respect, the traditional transformation into wine or beer is an avenue worth exploring. Due to its nature, it is difficult for Burundi to develop a specialization to achieve an economy of scale that would enable it to compete on world commodity markets. It is necessary to target markets with higher added value. In this regard, alcoholic beverages - without including the issue of public health policies - represent a potential market, including on a sub-regional level. Burundi has a wealth of expertise, and upgrading the sector could be one way forward.

6.3. Strengthen technical advice and support services in the rice and maize value chains, focusing on the resilience of cropping systems.

In order to respond to the climatic and phytosanitary risks affecting maize and rice production, it is also essential to work on **strengthening technical advice and support systems** in both sectors.
Technicians of the Ministry of Agriculture need to be supported and strengthened in order to:

- Understand the issues involved in holistic agricultural risk management on farms, and to help farmers evolve from a position that has historically focused on the extension of twentieth-century intensification practices (monoculture), which can sometimes lead to increased risks for farmers, towards a position of technical support and co-construction with farmers in the search for cropping systems that are both more resilient and more efficient;
- Understand the constraints, risks and opportunities specific to rice and maize cultivation;
- Familiarize themselves with agroecological fertilization, tillage, association, rotation and crop protection techniques, as well as the overall approach to agroecology as a cropping system geared towards the resilience of crops and farms.

As the technical teams of the Ministry of Agriculture are limited in size and have numerous missions, other advisory structures will also need to be identified (farmers' organizations, women's associations, youth associations, local NGOs, local authorities, etc.) to participate in the dissemination of new advisory and technical support practices relating to Agricultural Risk Management and the search for improved resilience and productivity of these two crops. This activity will need to pay particular attention to the role of women (who are often excluded from farm advisory services) and young people (who are particularly sensitive to innovations and changes in practices) in the implementation of all its stages.

6.4. Enhancing the supply of agricultural, agro-meteorological and commercial information using ICTs

Information is one of the keys to managing both production and market risks. Thanks to **new information and communication** technologies (ICT), information gathering is faster and less costly. Monitoring changes in rainfall, phytosanitary pressure (as mentioned in 6.2) or prices no longer requires sending dozens of surveyors out into the countryside but can be done at lower cost by building networks of village informers and discussion and information-sharing groups between farmers. **The example of the N'kalô service** in West Africa *[72]* shows that a single market analyst can easily monitor price and demand trends across a country's main production basins.

As with prices, with a small group of specialized technicians and a good network of players in the production basins, it is possible to **monitor production constraints, disseminate technical solutions** when risk levels are moderate, and **plan public intervention** when risk levels become too extreme.

This proposal involves setting up **a unit within MINEAGRIE to monitor and disseminate information on the two grain sectors.**

[72] www.nkalo.com

In the initial stage, this unit will be able to build up its information-sharing network in the areas targeted by the program and on the two grain commodities, rice and maize, but over time, it will be able to extend the scope of its information gathering and sharing to all the production areas and actors involved in the two commodities, and then to other agricultural commodities.

As always, the network(s) for collecting, sharing and disseminating information will need to be built by integrating the diversity of actors within each link of the value chain (women, young people, migrants, small-scale entrepreneurs as well as large-scale traders and industrialists). The network's coordinators will need to be trained in the Agricultural Risk Management approach and focus on the rapid circulation of information on all subjects relating to climatic, phytosanitary and market risks.

This information unit focused on the rice and maize value chains could also be used as a source of information for structural risk management bodies such as the National Platform for Risk Prevention and Disaster Management and a possible national Early Warning System (EWS).

6.5. Promoting Burundi's unique model internationally while pursuing innovation

As mentioned in the introduction, Burundi's overall production system is remarkable in many respects. Its evolution towards a "labor-intensive **garden system**" makes it one of the most densely populated rural areas in the world, with **advanced agroecological practices** (intra- and interspecific associations, rotations in time and space, multi-store agroforestry systems...).

We could therefore envisage the establishment of an **International Centre for Training and Research in Agroecology** in Burundi.

Given the predominant role played by women in rural work, this centre would also enable them to put their knowledge to good use.

This center would have several functions:

- *Active monitoring:* tracking innovations by farmers. The agrarian history of Burundi illustrates the capacity of rural societies to innovate against a "Malthusian" vision of development. These innovations could be documented, measured and disseminated.
- *Co-construction research:* as mentioned above, certain agroecological practices could be optimized, enriched or combined (at different levels). The co-construction of new methods would be at the heart of the center's research approach.
- *Training:* the center would offer practical training courses, including for a Western audience, thus overturning the prejudices associated with African agriculture. Some transition farms in Europe (e.g., La ferme du Bec Hellouin), thanks to labour-intensive agroecological methods, have become successful training centers. Such training courses could be offered in Burundi. Gender issues and inclusion in agriculture could also be addressed.

6.6. Strengthening cluster effects within value chains rice and maize

As explained in the report, **a multitude of small-scale operators** are active in the trade, processing and distribution of grains. The main risks, aside commercial risks, concern unpredictable interruptions to processing activities due to intermittent access to power.

The spread of operators offers advantages (strong resilience in sectors, economic dynamism and job creation in rural and urban areas) but also disadvantages (limited economies of scale, no synergies on support functions, limited and poor-quality infrastructures, irregular access to energy). Gradual support for these actors could eventually lead to the **structuring of grain value chains**. Progressive support is important, and we have also seen how difficult it is to amortize poorly sized processing facilities such as some of the mini-rice facilities built by the PRODEFI project.

The cluster effect can enable the exchange of commercial information (on prices and stock availability), the dissemination of technological innovations (for example, small-scale granulators *[73]* in the custom animal feed sector enable granules to be made from local ingredients) or stimulate the emergence of support functions (for example, mechanics to maintain equipment).

To encourage this, a public intervention could be the **construction of modular infrastructure** (accessible to actors of different scales) providing a range of attractive services (storage, drying areas, loading/unloading areas, secure energy access, waste management and recycling, feed production - particularly for the rabbit industry). However, a **feasibility study** is needed to assess the size, business model and requirements of the various operators.

In the long term, these "clusters" would become reference markets, similar to the Tanzanian "wholesale markets", whose adaptation to the Burundian context have been examined in a study *[74]*. They could also house buffer stocks managed by ANAGESSA to regulate markets.

The involvement of farmer organizations in these clusters, along the lines of CAPAD and its marketing subsidiary SOCOPA, could be an added advantage.

A gradual approach would involve an initial phase with a few pilots of two types:

- **Pilots** near or in key **urban centers** (Ngozi, Gitega, Cibitoke, Kirundo, etc.).

- **Pilots in rural areas**. The approach should be based on the 6.1 and 6.2 recommendations, with the "watershed" as a relevant entry point. Storage and processing equipment needs could be identified, together with service providers currently active in rural areas. Intervention would then be aimed at supporting active service providers to increase their range of services (rice husking and milling, for example) or enhance their technical and economic performance (via access to power, for example).

On these sites and in existing grain processing hubs, the promotion of solar kits adapted to the needs of small grain processing facilities will also be a strategic objective.

[73] Machines for making granules from local ingredients

[74] https://gret.org/wp-content/uploads/2021/12/Rapport-etude-commercialisation-Burundi-26-Fevrier-2014.pdf

This component could consist of a cost-sharing subsidy mechanism (50%) for access to solar electricity kits (panel, alternator and battery) adapted to the consumption of the small mills, seeders, grinders, huskers, compactors and baggers used in the sector. In the context of Burundi's landlocked and highly decentralized economy, this type of solar kit seems particularly well-suited. It will strengthen the resilience and competitiveness of some of the industry's downstream actors, without seeking to bring about a major technological breakthrough that could destabilize the sector.

In this particular area, it will be essential not to resort to distribution or centralized ordering, so as not to compete with solar kit distributors already active in the country, or supply equipment that cannot benefit from a local after-sales service. It will therefore be essential to use a subsidy mechanism for decentralized purchasing, and to include warranties, availability of spare parts and after-sales service in the drafting of procurement terms.

6.7. Conduct a technical and economic study of the fertilizer sector

The **use of fertilizers and fertilization methods adapted to soil deficits and nutrient exports** is an important factor in **mitigating** farming-related risks *[75].* The sector is one of the government's priorities and a major concern for many TFPs (see, for example, the soil map produced by IFDC). More importantly, it is a priority for farmers, whose strategies for accessing manure are extremely diverse and innovative. Similarly, meticulous, micro-localized manure spreading strategies highlight the priceless value of fertilizers (particularly organic) for farmers.

The creation of FOMI and its associated monopoly is a government response to strengthen Burundi's capacity to respond to needs. However, a monopoly has long-term disadvantages. It would therefore be advisable to carry out a technical and economic study, whose aim would be to support the government in controlling the import of essential fertilizers in order to avoid shortages (and thus benefit from the efficiency of the market economy in supplying goods), while at the same time establishing adequate levels of taxation to enable the development of FOMI.

Diversification of the supply of organo-mineral fertilizers, for better adaptation to different commodities and/or soil and climate conditions, also seems to be a necessity.

Additionally, the risk assessment of the rabbit farming sector reveals a lack of valorisation of manure and urine from rabbit farms, which could be an important source of organic raw material for fertilizer production.

6.8. Better define ANAGESSA's intervention methods and develop a program to strengthen the agency technically and financially in order to achieve a sustainable policy for regulating the volatility of the grain market

As described in the report, the current operations of ANAGESSA are highly disruptive to markets, and therefore constitute more of a risk for the rice and maize value chains than a risk reduction mechanism.

While the overall strategy is sound (creating food security stocks to mitigate crises while at the same time stimulating local production), the methods and capacity for intervention are ill-suited to the context of grain markets and the challenges of regulating these strategic sectors.

A technical and strategic study should make it possible to refine ANAGESSA's intervention methods to consolidate its regulatory role.

[75] With regard to this point, it is essential to consider that a significant part of phytosanitary pressure can be mitigated by fertilization that is adapted to both the environment and crops.

To this end, it is necessary to develop a clear strategy and defined methods of intervention, and to establish the right sources of information on which operational decisions can be based.

Synergies between ANAGESSA and rice cooperatives with storage facilities could also be considered.

6.9 Analyze the priorities and economic potential of insurance schemes in rural areas

In addition to the pilot initiative by the NGO CORDAID described above, many Burundian institutional actors are keen to develop agricultural insurance in Burundi.

The development of index insurance (or parametric insurance) to manage weather risks, and even weather and plant health risks (yield risk), is confronted with numerous economic constraints (producers' ability and interest in paying, transaction costs for collecting premiums and paying compensation) and technical constraints (reliability of indices, reliability of yield construction models, adaptation to a diversity of varieties and production systems).

Generally speaking, index insurance works mainly through partnerships between manufacturers or large traders, who supply inputs to farmers on credit and deduct the premium from the payment when purchasing from them (reducing transaction costs). Since this type of partnership model is very rare in Burundi (except in the sorghum sector with the Brarudi brewery), the economic success of such insurance seems difficult to ensure.

Furthermore, experience shows *[76]* that in many rural areas, yield insurance may not be the priority insurance option for farmers. Accident, serious illness, pregnancy or death insurance may be in greater demand than production insurance.

It would therefore be interesting to carry out an in-depth economic analysis of the supply and demand for insurance products in rural areas in Burundi and to assess the conditions for the successful development of insurance products in the country, drawing inspiration from contexts similar to Burundi's (Rwanda, Uganda, Kenya, Tanzania).

[76] https://www.inter-reseaux.org/wp-content/uploads/revue_spd_25_fr.pdf

7_ Appendices

Annex 1. Action plan for a risk management program across the rabbit, rice and maize value chains

The proposed action plan aims to design a 5-year program for agricultural risk management in the maize, rice and rabbit sectors in Burundi.

The general objective of the agricultural risk management program could be as follows:

Support the sustainable growth of the maize, rice and rabbit value chains in Burundi by developing

agricultural risk management and upstream-downstream partnerships involving all actors.

Three specific objectives of the program could include:

- OS1: Strengthen the resilience of the three value chains through strategic infrastructures and inclusive governance at the territorial level
- OS2: Strengthen advisory and support services for production through a risk prevention approach
- OS3: Improve the production and sharing of information within sectors to strengthen the ability to anticipate, mitigate and regulate risks

The logical framework below proposes a reorganization of the actions recommended in the analysis of agricultural risks for the three sectors, structuring them around the three specific objectives and proposing courses of action (in chronological order of implementation) and result indicators for each of the actions proposed.

This action plan will be specified, budgeted and detailed during the design phase following validation of the three agricultural risk analysis reports.

OS	Strategic focus areas	Actions	Actions Expected results
SO1: Strengthen the resilience of the three value chains through strategic infrastructures and inclusive governance at the territorial level	**Establish facilities and infrastructures for collective water management on a landscape and watershed scale**	- Identify two strategic watersheds for collective improvement of water management - Conduct a territorial and participatory diagnosis of the watershed. This diagnosis will be based on technical analyses of the physical environment and its characteristics (topography, soils, hydro-graphic network, natural resources, degraded areas, exposure to risks, land use and its history), socio-economic analyses and on inclusive consultation with watershed users. It will also be necessary to map out the stakeholders and their roles (local authorities, water user associations, farmer organizations, self-help groups) - Create a watershed development plan (or equivalent, depending on the tools available within the targeted local territories) which will incorporate elements of the diagnosis and devote a section to the problem of water management (drinking and industrial) to identify the issues and developments to be carried out - Conduct a feasibility study of the improvements to be made, as specified in the Watershed Development Plan: including technical works (dams, irrigation channels, access tracks, distribution network) and landscaping works (bank protection, spreading plains, forestry massifs) in consultation with the local authorities - Implement development projects and provide training for users, including a substantial social engineering component - Monitor the implementation of the development plan and training of the various stakeholders - Seeking additional funding for other components of the development plan (education, health)	- 2 pilot watersheds are being developed using a systemic approach (including all uses of the watershed, not just the "marshes") and incorporating farmers' expertise. - 50,000 watershed users (farmers and residents) are positively impacted by these pilots and benefit from improved water management.
	Supporting grain trade and processing through the construction of dedicated clusters	- Identification of strategic commercial poles for the establishment of 10 grain clusters - Identification of operators (traders, processors, cooperatives, input suppliers, SFDs, banks, equipment suppliers) located in the vicinity (commune) of the pole and their interest/capacity to invest in access to better quality and grouped marketing and processing infrastructure - Conducting economic and technical feasibility studies for each of the 10 clusters, including choice of location, layout of buildings and other infrastructure (parking, traffic lanes, drying areas, retail sales areas, waste disposal areas) and autonomous energy supply (solar panels) as well as any additional services (warranty/holding, repair/maintenance/sale of machinery), space for agri-food activities other than cereals (other dry grains in particular) - Identification of cluster governance structure (users association/cooperative, local authority) and financing structure for cluster maintenance and development (rents, charges proportional to electricity consumption) - cluster creation and promotion	10 cereals clusters of 5,000 m2 are being built in strategic locations, are energy self-sufficient and comprise a minimum of 200 operators specializing in grains
	Subsidize investment in rabbit farming infrastructure	- Establishing a list of priority infrastructure and equipment for risk reduction in the rabbit sector (hutches, transport crates, manure collection systems, insemination tools, etc.) - Defining procedures for selecting applications, awarding subsidies and justifying expenditure - Introducing a subsidy fund for rabbit infrastructure and equipment	- 1,000 operators in the rabbit farming sector benefit from a shared-cost subsidy for the acquisition of equipment dedicated to their activity in the sector
	Promoting the value of rabbit products	- Identifying the skills and the host organization of the centre for the promotion of rabbit farming products - Recruiting and/or training of the center's staff - Supporting market research in Burundi and the sub-region - Supporting communication on the uses of rabbit products - Incubator for start-ups promoting rabbit products - Innovation competitions and awards (with different segments: gastronomy, offal valorization, dejection valorization, skins and weights valorization, etc.)	- 1 promotion center is operational - 10 market studies on rabbit products are produced and published. - 50 companies specializing in rabbit products have been supported by the center and have seen their sales increase by over 30% as a result.

SO2: Strengthen advisory and support services for production through a risk prevention approach	**Supporting action research on integrated crop protection for grains**	- Set up a national public-private working group (ISABU-type research institute, Ministry of Agriculture, decentralized government departments, input suppliers, NGOs working with farmers). This working group will draw up a national strategy for action research in the farming environment. This national strategy will identify priority issues and possible levers for addressing these issues, particularly through integrated protection of cereal crops, which could incorporate the recommendations of the risk analysis report (preventive control, curative control, multi-dimensional approach to plot and landscape) - Implementation of pilot projects consistent with the national strategy. Depending on the capacities of actors in the working group, pilot projects will be implemented in the farming environment to test agroecological innovations for integrated crop protection - Evaluation, capitalization and dissemination of the results of the pilot projects to agricultural research and advisory organizations in Burundi	- A national strategy document on integrated crop protection - At least 10 pilot projects to promote integrated pest management implemented by the public and private sectors
	Strengthen the technical skills of advisory services through an approach focused on crop resilience	- Carry out a skills assessment of local advisory services operating in Burundi - Design a theoretical and practical training programme to upgrade local advisory services - Practical implementation of advisory services for 4,000 farms (linked to the watershed if possible), Support for advisors via tailored technical assistance for local advisory services in order to incorporate an approach focused on the resilience of farming systems - Evaluation of the system	- A training curriculum is established - 200 advisors are trained - 4,000 family farms are supported
	Building national expertise to support rabbit farms	- Identifying six (6) international rabbit farming experts and organising a mission to enable them to carry out a diagnosis of Burundi's rabbit farming and the main pathologies present - Identifying 18 future national experts (including a minimum of six (6) breeders and a minimum of six (6) private veterinary service providers) - Training programme for the 18 national experts by the six (6) international experts - Designing protocols for diagnosing rabbit pathologies and preparing rabbit feed - Publishing the list of national experts, their contacts and their areas of specialization in all communes of Burundi	- Six (6) international experts and 18 national experts have been trained and regularly exchange information on risk management and the development of the rabbit industry; - 20 technical fact sheets on rabbit pathology diagnosis and rabbit farming in Burundi have been produced and are available online.
	Preventing the import and spread of rabbit pathogens	- Confirming the value of importing breeding stock for the development of the industry by international experts - if this value is confirmed: identify competent and certified foreign laboratories to detect possible contamination of breeding rabbits prior to import, drafting a decree to set out the rules for control and quarantine (particularly for the identification of healthy carrier animals) prior to any import of any rabbits into Burundi - disseminate the decree and implement it at all the country's border posts	- A report on the suitability and requirements for importing rabbits into Burundi is published and available online - Myxomatosis, VHD and their variants are not present in Burundi

SO3: Improve the production and sharing of technical information within sectors to strengthen the ability to anticipate, mitigate and regulate risks.	**Build an offer and a network for sharing information on meteorological, phytosanitary, sanitary and market risks in the rice, maize and rabbit sectors.**	- Identification of reliable, up-to-date, regular and responsive sources of information on weather, phytosanitary, health and market risks in the 3 sectors - Identification of the organization(s) hosting the information gathering and sharing unit - Recruitment and training of teams responsible for collecting and sharing information by international experts - Identification of the most effective and sustainable (in terms of recurring costs) communication channels for sharing information with and between actors (community radio, SMS, WhatsApp and Facebook communities, etc.) - Circulation of regular, up-to-date and reliable information to actors and consideration of their questions and information sharing at the unit level	- A unit for the preparation and distribution of regular (minimum monthly) information on risks in the 3 sectors is operational - 300 information media on risks have been distributed to players in the three sectors - 60,000 actors in the 3 sectors have received at least two information messages on agricultural risks distributed by the unit.
	Support the creation of a network of national rabbit breeders	- Creation of an evaluation grid for breeders' selection skills by the expertise unit - Mission to identify the most experienced stockbreeders - Training of 40 stockbreeder in population monitoring and inbreeding risk mitigation - Organization of biannual meetings between these stockbreeders - Creation of a breeders' WhatsApp group - Creation and annual updating of a catalog of rabbit characteristics with breeders' availability and contacts - Organization of 4 annual rabbit fairs to bring together breeders and fatteners from different provinces.	-at least 40 stockbreeders have been identified and trained - at least 16 trade fairs have been organised, giving stockbreeders the opportunity to present their breeding stock and characteristics and to exchange ideas. - 4 successive versions of the rabbit breeding catalog are published and available online
	Conduct economic studies on the development of the fertilizer sector, the development of insurance products for farmers and the strengthening of ANAGESSA's mandate and technical capacity.	- Conducting an economic study on the development of the national fertilizer supply within a competitive framework - Conducting an economic study on the demand for insurance products from agricultural actors, the conditions for the profitability of insurance products and the technical feasibility of providing support for the development of an insurance product tailored to the rural community, taking inspiration from international examples - Conducting an economic and technical study on regulating the grains market through public intervention by ANAGESSA in the purchase and sale of grains at critical times, including the methods for initiating intervention, infrastructure and equipment requirements (CAPEX) and long-term financing (OPEX) for ANAGESSA.	- Three (3) studies are published and available online - Three (3) workshops to operationalize the results of the studies are shared with all the institutions and private actors concerned, leading to a roadmap for the implementation of the necessary reforms and investments.

Annex 2. **Survey methodology**

The study of agricultural risks in the maize, rice and rabbit sectors in Burundi was based on the PARM methodology defined in a practical guide:

"Assessing value chain risks to design agricultural risk management strategies".

1. An initial inception report produced in January and validated in February 2024 targeted the main risks on the three value chains designated by the government, namely: rice, maize and rabbits *[77].*
2. Following this report, a study phase of agricultural risks was organized in January and February 2024 on all three targeted value chains, leading to the establishment of a risk assessment (scoring) grid;
3. Concurrently, a study of vulnerability to agricultural risks was conducted over the same period, listing the agricultural risk management tools, mechanisms and skills already implemented and/or planned in the pre-targeted agricultural value chains in Burundi;
4. Following these risk and vulnerability assessments, a risk map was drawn up in March-April 2024, prioritizing the risks with the highest level of vulnerability. This prioritization was then presented, discussed and adapted with the Burundian government and the institutions involved in the sector during workshops held on 23 and 24 May 2024, leading to the final stage, the development of an action plan for the implementation of agricultural risk management tools and policies *[78].*
5. The fifth and final stage over the next few months will be to develop an action plan for the implementation of agricultural risk management tools and policies in Burundi, focusing on the three targeted value chains and the risks with the highest vulnerability rates. It will be presented and validated at a Workshop.

To gather information on risks (frequency, intensity) and risk management capacities, the consultants produced interview guides by link, which are available below.

During these initial interviews, in addition to focus groups with maize and rice producers and rabbit breeders, the PARM experts were able to engage 3 feed millers, 3 rice hulling units, 3 flour mills, 3 grain traders, 3 input suppliers, the agricultural managers of 3 banks, 3 veterinary input shops, 2 communal SGs, 6 communal monitors and agronomists, ANAGESSA, the BESD and the MINEAGRIE CT.

Following these discussions, a decision was made to conduct a short quantitative survey with rice and maize farmers to identify risk frequency and intensity indicators.

A total of 254 maize farmers and 213 rice farmers were interviewed using a digital form on ODK Collect software, in all the farming provinces. The breakdown of interviews is shown in the table below. A map also shows the geographical distribution of the interviews. The qualitative interview guides and interview questionnaires are presented next.

The selection of farmers to be interviewed was based on the following methodology:

[77] Rice and maize are two commodities already targeted by COMPACT Burundi for food and agriculture, alongside pigs and poultry. Targets in terms of production scores, exportable surpluses, potential revenues generated, and jobs created have been defined in this document. Rabbits, on the other hand, are an emerging priority for the President of the Republic, and have attracted the attention of MINEAGRIE, which ranks this sector on the same level as poultry and pigs.

[78] The first workshop was attended by 34 participants and the second by 72.

- Conduct interviews on a minimum of 2 different hills, at least 1 of which is not on a paved road;
- Priority is given to talking to small farmers cultivating areas of less than 2 ha;
- Interview a minimum of 5 female rice farmers and 5 female maize farmers (no maximum).
- Field interviews, i.e., on or near plots of land cultivated by the farmer.
- Activate GPS on your mobile phone before the start of the interview and for the duration of the interview.
- Use the ODK form provided by Nitidae when discussing all issues with farmers;
- If an interview did not run smoothly, indicate this at the end of the questionnaire (interview self-assessment Q56) and provide explanations in the free comments (Q58).
- When interviews are conducted off-line via the ODK application, the results must be transferred on return to the place of residence or as soon as internet connectivity is available;
- Annotate in the comments section at the end of the questionnaire any information relevant to understanding agricultural risks and risk management strategies that could not be transcribed via the questions;
- Finalize and validate the questionnaire immediately after the interview.

Figure 33: Farmers and breeders interviewed by region and gender.

Provinces	Maize farmers	Maize farmers	Rice farmers	Rice farmers	Rabbit farmers
Bubanza	5	8	9	4	
Bujumbura	12	3	8	10	8
Bururi	15	10			
Cankuzo	10	2	8	4	
Cibitoke	7	10	10	6	
Gitega	11	8	12	12	8
Karuzi	5	7	7	5	3
Kayanza	8	5	10	3	5
Kirundo	6	7	8	6	
Makamba	12	4	9	6	
Muramvya	10	2	8	4	
Muyinga	6	6	10	2	
Mwaro	18	6			3
Ngozi	5	8	12	2	
Rumonge	6	6	8	5	
Rutana	7	7	4	9	
Ruyigi	7	5	6	6	
Total	**150**	**104**	**129**	**84**	**27**

Figure 34: Map of interviews with farmers and breeders.

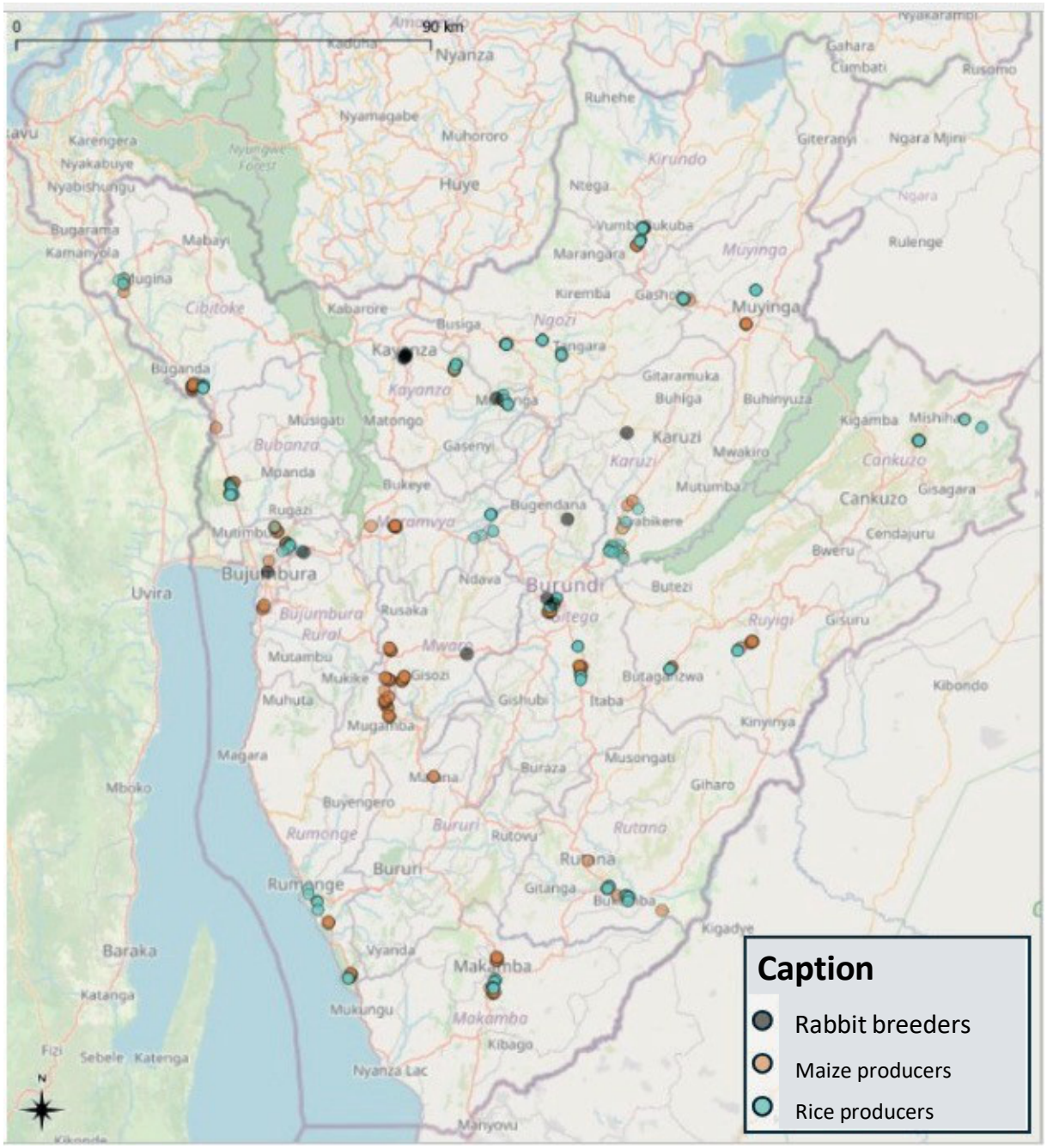

Figure 35: Interview guides for maize and rice farmers

Interview guide farmers: maize and/or rice

Presentation of the farm: status, location, share of maize and rice in the crop rotation and in activities, type of crops grown (associated, pure, lowland, hillside, water management)

Production practices: history of the farm, changes in crop rotation, introduction of new practices, new crops, discontinuation of certain practices, etc. Reasons for these changes? Main crop rotations involving rice or maize.

Main costs and constraints of maize and/or rice production?

Cereals marketing: marketing locations, marketing periods/peaks (depending on market or cash flow needs), sales planning, selling prices according to time periods, sales locations and quality criteria. Year (and possibly month) in which sales prices were the best in the operator's entire experience. Why was this a good year? Year (and possibly month) with the lowest sales prices in the producer's entire experience. Why was it a bad year? Other reasons for price variations? Perception of institutional purchasing/institutional purchases as part of the Alliance Nationale de Gestion des Stacks de Sécurité Alimentaire (ANAGESSA) [National Alliance for Food Security Stack Management]. Impact of food donations and sales at social prices?

Risks, "very challenging experiences": worst experiences in agriculture? Let the producer tell his/her story, then explore the reasons (as a reminder: disease/pest, theft, drought, flooding, storage losses, soaring input prices, inability to access inputs, to sell, drastic drop in selling price). Try to prioritize. If possible, give a frequency indicator (1 event every 7 years, 15 years or 30 years). Volume of lost income.

Adaptation strategy: How did you cope with this situation?

Mitigation strategy: What are you doing to prevent this situation from happening again?

Support: Have you ever received technical support for maize/rice? From whom (supplier, customer, other farmers, NGOs, government services, other)?

Prospects: would you like to grow more cereals? Less? Would you prefer to invest in other activities? If so, which ones? Do you feel that demand is growing or stagnating? Why do you think this is? How can we support the industry?

Figure 36: Interview guide for other actors in the value chain

Interview guide for private players up and down the value chain

Presentation of role and actions carried out, type of relationship with other parties (opportunistic, contractual, etc.)?

Activity costs: main objectives for the 3 commodity chains (maize, rice, rabbit)?

Main constraints of the commodity chain: let the person answer freely, encourage him/her to prioritize and explain the constraints.

Risks "Very difficult experiences" : worst years for the sector? Why these worst years?

Adaptation strategy: How did the sector deal with this problem?

Mitigation strategy: What are you doing to prevent this situation from recurring?

Documentation: do you have any documents describing the sector, its constraints, or risks?

Databases: do you have databases that can help us quantify the intensity (impact) and frequency of risks in one or more or several of the 3 sectors?

Outlook: How do you see the future of the sector? What are the priorities for the coming years?

Figure 37: Rice farmer questionnaire

		English
Rice Production Risk Questionnaire		
Q1		Province?
R1	*Drop-down list*	*see list*
Q2		Municipality?
R2	*Drop-down list*	*see list*
Intro		We're going to talk about the risks and problems of growing rice. I'm going to present you with some risks and for each of them I'm going to ask you how many times this problem has occurred and how much you think you lost the last time it happened.
Q3		How many years have you been growing rice?
R3	*figure*	
Q4		Comments
R4	*T ext*	
Weather		
Q5		How many times has lack of rain caused losses since you started growing rice?
R5	*figure*	
Q6		The last time the lack of rain caused losses, how much do you think you lost?
Q6.1		Expected quantity (kg)
R6.1	*figure*	
Q6.2		Quantity harvested (kg)
R6.2	*figure*	
R6.3	*Text (comments)*	
Q7		Combien de fois, l'excès de puies a-t-il provoqué une desctruction des infrastructures d'irrigation (canau x,
R7	*figure*	
Q8		The last time excess rain caused losses, how much do you think you lost?
Q8.1		Expected quantity (kg)
R8.1	*figure*	
Q8.2		Quantity harvested (kg)
R8.2	*figure*	
R8.3	*Text (comments)*	
Q9		Depuis que vous cultivez le riz combien de fois, l'excès de pluies a-t-il provoqué un envasement de votre pa
R9	*figure*	
Q10		The last time excess wind caused losses, how much do you think you lost?
Q10.1		Expected quantity (kg)
R10. 1	*figure*	
Q10.2		Quantity harvested (kg)
R10. 2. 1	*figure*	
R10. 3	*Text (comments)*	
Q11		How many times has hail caused losses since you started growing rice?
R11	*figure*	
Q12		The last time hail caused losses, how much do you think you lost?
Q12.1		Expected quantity (kg)
R12. 1	*figure*	
Q12.2		Quantity harvested (kg)
R12. 2	*figure*	
R12. 3	*Text (comments)*	
Q13		How many times has cold weather caused losses since you started growing rice?
R13	*figure*	
Q14		How many times has cold weather caused losses since you started growing rice?
Q14.1		Expected quantity (kg)
R14. 1	*figure*	
Q14.2		Quantity harvested (kg)
R14. 2	*figure*	
R14. 3	*Text (comments)*	
Q15		How many times has an insect caused losses since you started growing rice?
R15	*figure*	
Q16		What type of insect causes the most damage?
R16	*T ext*	
Q17		The last time an insect caused losses, how much do you think you lost?
Q17.1		Expected quantity (kg)
R17. 1	*figure*	
Q17.2		Quantity harvested (kg)
R17. 2	*figure*	
R17. 3	*Text (comments)*	
Q18		How many times has a disease caused losses since you started growing rice?
R18	*figure*	
Q19		Which types of disease cause the most damage?
R19	*T ext*	
Q20		The last time a disease caused losses, how much do you think you lost?
Q20.1		Expected quantity (kg)
R20. 1	*figure*	
Q20.2		Quantity harvested (kg)
R20. 2	*figure*	
R20. 3	*Text (comments)*	

Inputs		
Q21		How many times have you had trouble finding rice seed at planting time?
R21	*Figure*	
Q22		What was the loss or delay the last time this happened?
R22	*Text*	
Q23		How many times have you bought seeds that turned out to be bad or unsuitable for your zone?
R23	*Figure*	
Q24		What was the loss the last time this happened?
R24	*Text*	
Q25		How many times have you had trouble finding mineral fertilizers at the right time?
R25	*Figure*	
Q26		What was the loss or delay the last time this happened?
R26	*Text*	
Q27		How many times have you bought mineral fertilizers that turned out to be wrong or unsuitable for your specific application?
R27	*Figure*	
Q28		The last time this happened, what was the loss?
R28	*Text*	
Q29		How many times have you had trouble finding organic fertilizer at the right time?
R29	*Figure*	
Q30		What was the loss or delay the last time this happened?
R30	*Text*	
Q31		How many times have you bought a chemical treatment that didn't work on the disease or insect?
R31	*Figure*	
Q32		The last time this happened, what was the loss?
R32	*Text*	
Post harvest		
Q33		How many times have you had trouble drying your rice paddy because of heavy rains?
R33	*Figure*	
Q34		What was the loss the last time this happened?
Q34.1		Quantity dried (kg)
R34. 1	*Figure*	
Q34.2		Quantity lost (kg)
R34. 2	*Figure*	
R34. 3	*Text (comments)*	
Q35		How often have you had insects or rodents attack your stock?
R35	*Figure*	
Q36		What was the loss the last time this happened?
Q36.1		Quantity stored (kg)
R36. 1	*Figure*	
Q36.2		Quantity lost (kg)
R36. 2	*Figure*	
R36. 3	*Text (comments)*	
Q37		How many times have you been forced to sell your rice at a very low price compared to your expectations?
R37	*Figure*	
Q38		The last time this happened, what was the loss?
Q38.1		Expected price (BIF/kg)
R38. 1	*Figure*	
Q38.2		Lowest selling price finally obtained (BIF/kg)
R38. 2	*Figure*	
Q38.3		Quantity sold (affected by loss in kg)
R38. 3		
R38. 4	*Text (comments)*	
Q39		How many times have you lost part of your crop in transit?
R39	*Figure*	
Q40		The last time this happened, what was the loss?
Q40.1		Quantity transported (kg)
R40. 1	*Figure*	
Q40.2		Quantity lost (kg)
R40. 2	*Figure*	
R40. 3	*Text (comments)*	
Q41		How many times have you had part of your harvest stolen?
R41	*Figure*	
Q42		What was the loss the last time this happened?
Q42.1		Quantity stored (kg)
R42. 1	*Figure*	
Q42.2		Quantité volée (kg)
R42. 2	*Figure*	
R42. 3	*Text (comments)*	

	Other	
Q43		How many times has illness prevented you from carrying out farming activities at the right time?
R43	*Figure*	
Q44		What was the loss the last time this happened?
R44	*Text*	
Q45		How many times has an accident or injury prevented you from farming at the right time?
R45	*Figure*	
Q46		What was the loss the last time this happened?
R46	*Text*	
Q47		Do you want to describe another problem we haven't mentioned?
R47	*Text*	
Q48		What were the consequences of this problem?
R48	*Text*	
	Risk management	
Q49		Faced with these many risks, what can help you get through the bad seasons?
R49	*Text*	
	Information on the farmers	
Q50.1		Apart from maize, what other crops do you grow?
R50. 1	*Multiple choice (several choices)*	Beans
Q50.2		Other (please specify):
R50.2	*Text*	
Q51.1		Which animals do you own?
R51. 1	*Multiple choice (several choices)*	Cows
Q51.2		Other (please specify):
R51.2	*Text*	
Q52		Do you own a bicycle?
R52	*Yes/No*	Yes/No
Q53		Do you own a cell phone?
R53	*Yes/No*	Yes/No
Q54		If it's okay, please share your cell phone number (optional)
R54	*8Figures*	
		The rest of the questions are to be completed by the interviewer once the person has been released.
Q55		Type d'exploitation rizicole
R55	*Multiple choice (single choice)*	Marais aménagé/Umwonga utunganijwe
Q56		Sex
R56	*M/F*	Male / Umuga bo
Q57		Estimated age range
R57	*Multiple choice (single choice)*	Under 25 (imyaka iri munsi ya 25)
Q58		Self-evaluation of interview
R58	*Multiple choice (single choice)*	Perfectly passed (ikiganiro cagenze neza cane)
Q59		Take GPS coordinates of survey site
R59	*GPS*	Button
Q60		Commentaires libres sur l'enquête. Informations intéressantes à partager (si possible en français mais p o
R60	*Text*	
	End	Survey finalization (on site)

Annex 3. Input trading in Burundi

According to Biboza & Al. Taking all types of maize input together, 50% comes directly from the farm, 29% from the government or NGOs, and 6% from farmer associations. Only 15% come from traditional economic channels ("agro-dealers", market).

It should be noted that government subsidies for mineral fertilizers and improved seeds take the form of purchase vouchers that farmers can claim from local input dealers.

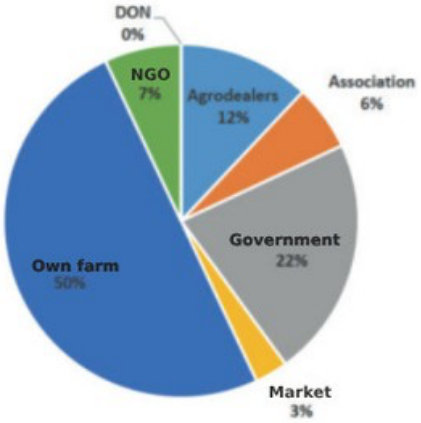

Figure 38: Sources of supply of maize inputs by farmers. Source: BIZOZA & Al (2022).

Fertilizers: insufficient FOMI supply to meet growing demand

The company Fertilisants Organo-Minéraux Industries (FOMI)*[79]* has enjoyed a national monopoly since the conclusion of a public-private partnership with MINEAGRIE in 2019. It offers a range of three organo-mineral fertilizers, two of which are recommended for maize crops (FOMI Imbura as a base fertilizer, FOMI Totahaza as a top dressing), and agricultural lime. However, urea is imported from abroad.

FOMI buys organic raw materials from Burundi (some farmers even regret that they can no longer obtain manure from their neighbours because FOMI buys it from them at a good price). Mineral elements, purchased by FOMI or others, are imported from Tanzania (93% of the total FOB value of imports), who in turn imports most of them from Morocco *[80]*. In 2022, (phosphate) fertilizers were Burundi's fourth-largest import category by value, behind fuel, vehicles and metals *[81].*

From 2015 to 2019, the Supporting Agricultural Productivity in Burundi (PAPAB) project helped to increase the number of farming households having access to fertilizers, estimated at 48% in 2019 in their final report. The ENAB 2019-20 shows that 54% of households use organic manure and 38% use mineral fertilizers. For the 2022-23 season, total fertilizer requirements were estimated at 145,000 t. Despite an increase in FOMI production from 8,000 t (2021-22)*[82]* to 17,000 t (2022-23), the company was unable to meet demand which was then estimated at 50,000 t *[83]*. The Burundian government took out a $4 million loan from the AfDB to urgently import 3,000 t of fertilizer *[84].* Unsurprisingly, this shortage fuels speculation on fertilizer prices *[85]*, ultimately fueling general inflation on agricultural commodities. In addition to the need to increase FOMI's production capacity, the import of mineral fertilizers has sometimes been hampered by a lack of foreign currency. Faced with these difficulties, the government resumed the possibility of importing fertilizers in 2023.

79 https://fomi.bi/
80 Source : UN Comtrade
81 Idem
82 https://www.jimberemag.org/mauvaise-recolte-2021-2022-agriculteurs-epinglent-fomi-burundi/
83 https://burundi-eco.com/les-larges-subventions-des-engrais-destabilisent-la-situation-budgetaire-du-pays/
84 https://www.afdb.org/fr/news-and-events/press-releases/le-burundi-recoit-le-soutien-du-groupe-de-la-banque-africaine-de-developpement-dans-des-secteurs-de-developpement-cles-60325
85 https://www.rpa.bi/index.php/actualites/bonne-gouvernance/la-speculation-dans-la-vente-de-l-engrais-de-l-usine-fomi

Maize farmers benefit from a government subsidy of about 30% of the cost of fertilizer. The national budget for this line was BIF 15 million in 2021-22.

In 2021-22, 62% of orders to FOMI came from provinces close to Bujumbura (Kayanza, Cibitoke, Bubanza and rural Bujumbura), which raises the question of accessibility to more remote provinces.

Plant protection products: due to their cost, they are rarely used for food crops

The Plant Protection Directorate (DPV) has a National Committee for the Approval and Control of Pesticides (CNHCP) which has approved 131 pesticides (69 insecticides, 3 nematicides, 16 fungicides, 23 herbicides, 16 rodenticides, 3 chemical mediators, 1 insecticide-nematicide) and banned 24 of them *[86]*. In the absence of a local industry, all authorized pesticides are imported, mainly from Uganda (75% as of 2021), which itself imports mass quantities from China and India.

These imports, which are exempt from customs duties and taxes, have been rising sharply since 2019, reaching 1,252 t in 2021, almost half of which are fungicides - mainly for potato crops (mildew) and rice (blast). In maize farming, fall armyworms are the main threat, attacking late March maize, and can be controlled with an insecticide.

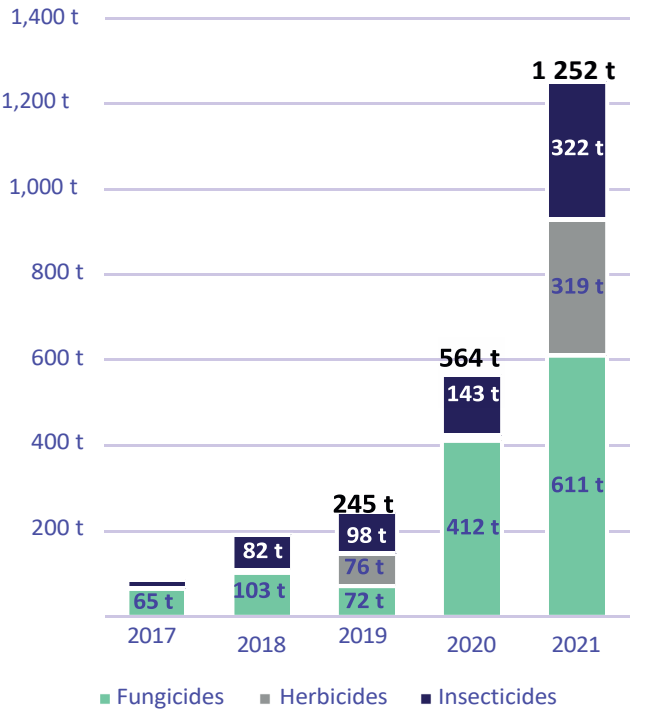

Figure 39: Pesticide imports by Burundi (source: UN Comtrade)

These imports are carried out either by public and para-public bodies, or by private companies (Alchem Burundi, Bolena, Cooper Burundi, etc.), and then inspected by a phytosanitary inspector. Small quantities of illegal imports from neighbouring countries are also taking place *[87]*.

Pesticides are then distributed to user areas by wholesalers and retailers, who are rarely specialized/qualified in this field. In theory, only structures approved by the DPV are authorized to market registered pesticides to farmers or community groups.

With the exception of potatoes, the use of pesticides is much more common for cash crops (cotton, coffee, tobacco, etc.) than for food crops, probably due to their onerous nature. The ENAB 2019-20 shows that the use of phytosanitary products by farming households remains a minority or even anecdotal: 12.9% use insecticides, 3.4% fungicides, 2.4% rat poison, 0.5% herbicides and 1.4% other types of products.

Note the recent effort to promote biological control and biopesticides (particularly neem-based) *[88]*.

[86] Source: NGO Propreté, Environnement et Santé (PES), 02/2021, Rapport National des Pesticides Hautement Dangereux au Burundi (National Report on Highly Hazardous Pesticides in Burundi)

[87] Source: Mineagrie (2018), Pesticide Management Plan

[88] https://www.inadesformation.net/burundi-promotion-des-biopesticides-contre-les-ravageurs-sur-les-cultures-de-mais-de-haricot-et-de-chou/

Notes

Managing risks to improve the livelihoods of producers

Platform for Agricultural Risk Management

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