



FEASIBILITY STUDY FOR THE DEVELOPMENT OF PUBLIC-PRIVATE SEED DELIVERY SYSTEMS IN BURUNDI



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Table of content

ABBREVIATIONS AND ACCRONYMS	iii
FIGURES AND TABLES	v
I. INTRODUCTION AND BACKGROUND	1
1.1. Introduction	1
1.2. The study area background	2
1.2.1. Crop variety and food security.....	3
1.3. Agricultural production systems	3
1.4. Current and recent agricultural development initiatives	5
1.4. Scope for the development of agriculture.....	7
1.5. Income source diversification in Burundi	8
II. CROP PRODUCTION SYSTEMS	9
2.1. Current crop production levels of major staple food crops: average crop yields	9
2.2. Description of the country's main agro-ecologies and their cropping systems.....	9
2.3. Current status of agricultural extension activities	12
2.3.1. Level of capacity of public extension system	12
2.3.2. Level of activity by non-governmental and private sector entities in agricultural extension of Burundi.....	14
2.3.3. Level of digital technology usage by extension staff.....	16
2.3.4. Level of adoption of improved crop varieties, by crop.....	16
2.3.5. Level of adoption of climate smart and highly nutritious crops	17
2.3.6. Level of utilization of fertilizers to increase crop yields, by crop	17
2.4. General description of the current system for marketing surplus production of staple crops	18
2.5. Food security situation	19
III. STATUS OF SEED SUPPLY IN BURUNDI.....	21
3.1. Introduction	21
3.2. History of crop breeding and seed supply in the country	22
3.2.1. History of crop breeding in Burundi	22
3.2.2. History of seed supply in Burundi.....	23
3.3. Recent and ongoing activities aimed at release of improved crop varieties, by crop	23
3.4. Recent and ongoing activities aimed at increasing supply of improved seed	23
3.5. Current options for smallholder farmers to access improved seed.....	24
3.6. Number of private seed companies operating in the country and their estimated annual supply	24
3.7. Other non-governmental and farmer-based organizations active in seed production and supply	26
3.8. Level of entrepreneurial capacity of average seed company owners.....	32
3.9. Facilities and equipment available for seed processing and packaging in the country.....	32
3.10. Tonnages of seed certified and marketed in the past four years, by crop.....	32
3.11. Number of agro-dealers currently in operation, by region.....	33

3.12.	Level of importation of certified seed from neighboring countries, by crop	34
3.13.	Average income/turnover of agro-dealers/merchants	35
3.14.	Average annual turnover (in\$) of seed companies	35
3.15.	Summary of prospects for improving seed supply	35
IV.	NATIONAL AGRICULTURAL RESEARCH SYSTEM	37
4.1.	Introduction	37
4.2.	Description of the public institutes and universities actively engaged in crop breeding .	37
4.2.1.	The public agricultural research institution (ISABU)	37
4.2.2.	Faculty of agronomy , university of Burundi (FACAGRO/FABI)	39
4.2.3.	Nature of recent or ongoing crop improvement activities, by crop	41
4.3.	Recent or ongoing collaborations with public institutions, farmer-based organizations, and private sector in seed supply	41
4.4.	Current status of crop variety licensing arrangements for production of seed by third party entities	42
V.	NATIONAL SEED POLICY FRAMEWORK	42
5.1.	Introduction	42
5.2.	Documents which control the production and supply of seed	43
5.3.	National catalogue of crops species and varieties	43
5.3.1.	Variety registration procedures	43
5.3.2.	Main crop varieties involved in seed certification	44
5.4.	Documents for seed quality control and certification	46
5.5.	Process for the official release of improved crop varieties	47
5.6.	Procedures for seed certification	48
5.6.1.	Active personnel	49
5.6.2.	Infrastructure	49
5.6.3.	Current status of basic (foundation) seed supply	50
5.7.	Procedures for production and supply of basic (foundation) seed	50
5.7.1.	Access by private seed companies to basic seed	50
5.7.2.	Policies for supply of basic seed by private sector	51
VI.	SUMMARY AND CONCLUSIONS	51
6.1.	Current status of access to improved seed among smallholder farmers	51
6.2.	Current status of government support for improving seed systems	51
6.3.	Trends and opportunities for seed systems improvements	52
6.4.	Recommendations	52
6.5.	Likely impact from the improvement of access to improved seed by smallholder farmers	
	53	
REFERENCES	54

ABBREVIATIONS AND ACCRONYMS

NGO : Non-Governmental Organization
SSG : Seed Systems Group
MINAGRIE : Ministère de Agriculture et de l'Élevage
FAO: Food and Agriculture Organization
FIDA : Fonds International pour le Développement Agricole (IFAD)
FFS: Farmer Field School
PNSEB : Programme National de Subvention des Engrais au Burundi
PNSSB : Programme National de Subvention des Semences au Burundi
IFDC: International Fertilizer Development Center
PSSD: Private Seed Sector Development
NAIP (PNIA): National Agricultural Investment Program
MPDRN : Ministère du Plan, du Développement et de la Reconstruction Nationale
MEEATU : Ministère de l'Eau, de l'Environnement, de l'Aménagement du Territoire et de l'Urbanisme
DGMAVA : Direction Générale de la Mobilisation à l'Auto développement et à la Vulgarisation Agricole
BPEAE : Bureau Provinciale de L'Environnement, de l'Agriculture et de l'Élevage
CAPAD : Confédération des Associations des Producteurs Agricoles pour le Développement
ACORD: A Cooperation Agency for Research and Development
PRODEFI : Programme de Développement des Filières
PAIVA-B : Projet d'Appui à l'Intensification et la Valorisation Agricoles du Burundi
ENAB : Enquête Nationale Agricole du Burundi
SRDI : Société Régionale de Développement de l'Imbo
ISSD: Integrated Seed Sector Development
ISABU : Institut des Sciences Agronomiques du Burundi
FACAGRO : Faculté des Sciences Agronomiques
INEAC : Institut National pour Etude Agronomique du Congo-Belge, Rwanda-Urundi
DPAE: Direction Provinciale de l'Agriculture et de l'Élevage
IRRI-ESA: International Rice Research Institute-Eastern and Southern Africa
ONCCS : Office National de Contrôle et de Certification des Semences
ISTA: International Seed Testing Association
EAC: East African Community
COPROSEBU : Collectif des Compagnies et Coopératives de Production des Semences du Burundi
COPROSEB : Compagnies de Production des Semences du Burundi
NASECO: National Seed Company (Uganda)
UHACOM: Union Haguruka des Coopératives Multifilières
UPH : Université Populaire Haguruka
UCODE : Union pour la Coopération et le Développement

PNSADR : Programme National pour la Sécurité Alimentaire et le Développement Rural de l'Imbo et du Moso

CRS : Catholic relief services

DPSP: Department of Promotion of Seeds and Plants

PAM : Programme Alimentaire Mondial

IRAZ : Institut de Recherche Agricole et Zootechnique

UNG : Université de Ngozi

CTNHV : Comité Technique National d'Homologation des Variétés

CNS : Commission National Semencier (National Seed Council)

BBN : Bureau National de Normalisation (National Bureau of Standards)

GDP: Gross Domestic Product

FIGURES AND TABLES

Figure 1 : Administrative boundaries and natural regions of Burundi	10
2	11
Table 1: Rate of food crop practice by season (% households by crop)	4
Table 2 : Crop combinations on farm plots of Burundi	5
Table 3: Crop produced in Burundi and their respective yield between 2013 and 2019.....	9
Table 4 : Natural regions of Burundi and their characteristics	10
Table 5 : Major crops produced and locations (provinces and natural regions)	11
Table 6: Household reached by extension services in 2019	13
Table 7: Rate of the use of improved variety by crop in 2019	17
Table 8: Utilisation of fertilisers among farm household of Burundi (2018-2019).....	18
Table 9: Major food commodity imports in Burundi (kg)	20
Table 10: Major food commodity exports from Burundi (kgs)	20
Table 11: Leading seed companies in Burundi.....	25
Table 12: Private seed companies and their estimated annual supply (kg)	25
Table 13: Evolution in seed producers of Burundi	26
Table 14: Main active seed producers for rice (2019).....	27
Table 15: Main active seed producers for maize	28
Table 16: Active seed producers for wheat.....	28
Table 17: Main active seed producers for bean	29
Table 18: Active seed producers for soybean	30
Table 19: Active seed producers for peanut	30
Table 20: Main active seed producers for potato	31
Table 21: Capacity of COPROCEB Seed Company	32
Table 22: Evolution in seed production in kg (2016-2019).....	33
Table 23: Recognised exclusive agro-dealers.....	34
Table 24 : Importation of certified seed in Burundi.....	35
Table 25: Location of the ISABU research centers and seed production	37
Table 26: ISABU scientific personnel engaged in crop improvement (number per crop).....	38
Table 27: FACAGRO scientific personnel engaged in crop improvement.....	40
Table 28: Main varieties of rice involved in seed certification	44
Table 29: Main varieties of maize involved in seed certification	45
Table 30: Varieties of hybrid maize involved in seed certification.....	45
Table 31: Varieties of wheat involved in seed certification	45
Table 32: Main varieties of bean involved in seed certification	45
Table 33: Varieties of soybean involved in seed certification.....	46
Table 34: Varieties of peanut involved in seed certification.....	46
Table 35: Varieties of potato involved in seed certification.....	46
Table 36: The ONCCS personnel.....	49
Table 37: Situation of the ONCCS laboratory.....	49
Table 38: Annual foundation seed production (in kg) from 2016 to 2019	50

I. INTRODUCTION AND BACKGROUND

1.1. Introduction

Rapidly growing populations and climate change have contributed to widespread food insecurity and poverty in some African populations. They are exerting an ever-greater pressure on farmers to improve their harvests. To achieve this, several conditions need to be met, including improved agricultural practices in general and good access to high-yielding and resistant seeds. Improved seeds allow farmers to increase their productivity while making the agricultural production systems more sustainable in the context of a growing world population and mutations.

Unfortunately, a large portion of African farmers who are most in need of better seed do not have access to it. It is simply not available in the rural villages and towns where they live. In addition, the low purchasing power of smallholder farmers put limits on the seed accessibility. Farmers get their seed via poorly and inconsistently government funded institutions and NGO efforts, from bulk grain traders, or they simply save and replant the same variety year after year.

As a result, most farmers are growing varieties that are several years old. These crops are prone to crop diseases and pests, and are especially vulnerable to the increasingly harsh agricultural conditions caused by climate change. Their crop yields remain very low compared to their capacity when using better seed. Most of such re-used seed is degenerated and therefore is not capable of producing enough food to meet households' basic food and income needs. The deficiency in local seed supply systems also severely restricts the farmer's ability to produce more nutritious food commodities for their household survival.

Approximately 38 million farmers live in 15 African countries where there is virtually no access to seed of improved crop varieties. These countries are home to 315 million people where the average rate of child malnutrition is 38 percent. With current population growth rates of 2.8 percent annually, their total population is projected to grow to over 700 million by 2050. This implies that food production should increase accordingly. However, with no access to improved seed, farmers of these countries have little chance to increase their farm productivity beyond current, subsistence levels. African farmers today need high-yielding, climate-resilient seed to overcome food insecurity and poverty in the population. This approach has been proven in several countries.

In this regard, the Seed Systems Group (SSG) seeks to extend the recent advances in seed systems development to farmers in countries of Africa that have so far been left behind in these innovations. SSG believes that every farmer in every village should have access to high-quality seed for a wide range of crop varieties. Therefore, SSG is working with governments and investors to make that come to reality.

In order to bring the benefits of improved seed to the farmers of these countries, the Seed Systems Group (SSG) undertook feasibility studies for seed systems development in these 15

countries. This report provides a synthesis of gathered data, information, and ideas related to crop breeding, seed supply, agricultural extension and related farmer awareness building activities, and rural input supply networks in Burundi.

1.2. The study area background

Burundi is a landlocked country in the Great Lakes Region in the central eastern part of Africa. It is bordered by Rwanda in the North, Tanzania to the East and South, and Democratic Republic of Congo in the West. The country covers an area of 27,834 km² of which 25,650 km² is made up of land.

The country is among the most densely populated countries in Africa and in the world. With a population estimated at 12 044 164 inhabitants in 2019, the population density is 433 inhabitants per km², with an average growth rate of 2.7 percent (ISTEEBU, 2019).

The country's economy is dominated by the agricultural sector, contributing around 40% of GDP, employing 84% of the labour force, and contributing over 95% to the food supply (PND, 2018). Cash crops supply around 4% of GDP while providing 90% of export earnings. The coffee crop alone provides about 80% and 10% for tea (MINAGRIE, 2014).

The population is mainly rural as the urbanization rate of Burundi is very low, averaging 10%. Therefore, rural livelihood is closely tied to agriculture as a source of both food and income (Niragira et al., 2015). However, the performance of this sector is poor and food insecurity and poverty incidence among households has increased steadily.

The leading agricultural products can be classified into food crops and cash crops:

- The food crops include: roots and tubers (sweet potato, cassava, taro, potatoes); legumes (beans, peas); cereals (maize, rice, wheat, sorghum, finger millet); vegetables and fruits; oilseeds (oil palm, sunflower, soybean);
- The cash crops include (coffee, tea, cotton, palm oil, sugarcane, tobacco) and occupy 10% of cultivated land.

In the past, adequate rainfall patterns and good soils had made Burundi self-sufficient in food production (Bergen, 1986). Currently, agricultural production is limited by the unavailability of high potential land and the progressive depletion of soil fertility and climate change (Cochet, 2004).

Agricultural production systems of Burundi have evolved in response to the high population density and the associated acute scarcity in agricultural land. Farmers adapted their farm practices towards a progressive and continued intensification of cropping systems with two main components:

- Multiplication of crop cycles and the spread of mixed or multiple cropping with the progressive disappearance of interspersed fallow periods;
- Spread of banana cultivation (Cochet, 2004; Rishirumuhirwa & Roose, 1998).

The latter has gained momentum in farming system due to its multi-purpose features. Banana residues are used as mulch, to control runoff and erosion, and to improve soil chemical and physical properties.

1.2.1. Crop variety and food security

With regard to crop varieties, farmers mainly rely on locally-produced seed and cuttings taken from previous harvests. Unfortunately, they have low performance potential and are degenerated in some cases. As an indication, the use of seeds from previous harvests in maize cultivation barely produces 800 kg/ha, while that of certified seeds (composite varieties) yield 3 to 4 tonnes/ha, and hybrids yield 7 tonnes/ha (ADISCO, 2014).

Access to quality seeds and high-yielding varieties in sufficient quantities adapted to agro-ecological conditions remains a major challenge for Burundian farmers. According to the Ministry of Agriculture, Environment and Animal Husbandry (MINEGARIE), the main causes of this limitation of the use of good quality seeds are:

- Low purchasing power of farmers,
- Competitive price of traditional seeds compared to certified seeds,
- Poor availability of certified seeds due the failure of the seed production chain,
- Poor information on the importance of good quality seeds,
- Poor information on the availability and demand of quality seeds,
- Low availability of high performing varieties meeting the preference of farmers.

As consequence, the country has the lowest crop yields in the region. Per capita agricultural production has been declining for years with obvious implications on food and nutrition security (Baghdadli et al., 2008, WFP, 2014). The overall energy requirement of the population is achieved at 75%. The deficit in food nutrients is more acute for protein and lipids with only 40% and 22% of the daily needs fulfilled respectively (MINAGRIE, 2008).

Per capita food production declined by 24% between 1993 and 2014 (WFP, 2014). The rate of chronic malnutrition among children under five years of age is 57.0%, with 25.6% in its severe form (ENSNMB, 2018). The 2014 Global Hunger Index report classified Burundi among the countries in an alarming situation (IFPRI, 2014).

1.3. Agricultural production systems

Agriculture is mostly rain-fed and subsistence-oriented, based on the use of traditional production technologies and limited access to agricultural input and output market infrastructures. Family farms produce mainly for household consumption using family labour and few external inputs.

The cropping calendar follows the rainfall patterns with two main seasons, namely the rainy season alternating with a dry season. The rainy season lasts about 8 months (October-May) while the dry season lasts for 4 months (June-September). A bimodal rainfall pattern allows three cropping seasons per year:

- The first cropping season (A), commonly known as 'Agatasi', occurs between October and January,
- The second cropping season (B) is called 'Impeshi' and lasts for almost 4 months (February to May).

A short dry period (with less frequent and light precipitations) occurs between these two rainy seasons (almost two weeks from end-January to mid-February). This allows farmers to handle agricultural produce from the first cropping season (A).

- The third cropping season (C) called 'Ici', occurs between June and September. In this dry period farmers mainly grow vegetables, beans, maize, potatoes and off-season crops such as rice in wetlands and in river valleys. Irrigated agriculture is highly under-developed in Burundi.

The table below highlight the importance of the three cropping season and the rate of household producing each crop by season.

Table 1: Prevalence of food crop production by season (% households by crop)

Crops	Season A	Season B	Season C	Average	Raking
Banana beer	75.4	74.5	70.3	73.40	1
Cassava better	76.9	74.3	68.2	73.13	2
Sweet potato	73.9	67.1	56.5	65.83	3
Banana plantain	70.4	63.2	59.9	64.50	4
Bush bean	66.5	67.2	27.7	53.80	5
Maize	87.0	29.6	26.5	47.70	6
Cassava sweet	50.8	45.3	37.9	44.67	7
Climber bean	55.3	58.7	4.2	39.40	8
Taro	53.2	43.1	21.0	39.10	9
Banana desert	45.4	37.2	33.8	38.80	10
Potato	31.7	14.2	11.9	19.27	11
Peas	20.2	21.8	3.1	15.03	12
Sorghum	14.3	16.8	7.4	12.83	13
Coco Yam	17.9	10.5	3.8	10.73	14
Rice	13.4	13.9	2.5	9.93	15
Peanut	16.1	10.3	1.3	9.23	16
Cajanus Cajan	11.7	10.6	5.2	9.17	17
Sunflower	10.2	8.6	5.0	7.93	18
Finger millet	9.5	4.6	0.2	4.77	19
Soybean	7.5	5.6	1.1	4.73	20
Cowpea	5.1	7.3	0.7	4.37	21
Wheat	2.7	3.7	3.3	3.23	22

A wide range of agro-ecological conditions allows a great diversity of crops in Burundi. The crops have different importance in the farming systems (table 1). In terms of household

adoption, however, banana, cassava, beans and maize dominate the farming systems of Burundi.

Farmers mainly produce through a mixed cropping system. This system has grown in importance since last decades due to several reasons. Farmers prefer to grow a wider range of crops to reliably produce even meagre quantity in order to minimize the risk of yield variability while maximizing outputs diversity. They prefer to secure household autonomy due to the unreliability of the food market, diet preferences, and risk (Cochet, 2001).

Therefore, most farms plots are intercropped except for plots bearing cash crops such as rice in the marshlands and cassava on highly degraded lands, which are usually mono-cropped. Farmers are likely to plant up to five crops on a single plot in order to cope with risks while minimizing yield variability in a more complex way. Results of recent studies showed that almost half of the plots bear at least four different crops.

Table 2 : Crop combinations on farm plots of Burundi

Proportion of plot (%)	Season A	Season B	Season C
Sole cropping	32.1	39.5	59.8
Crop Mixture	67.9	60.5	40.2
2 crops	26.2	29.3	28.5
3 crops	23	18.8	8.9
4 crops	14.2	9.5	2.4
5 crops	4.5	2.9	0.4
Total	100	100	100

This practice protects farmers against risks of crop failures caused by adverse climatic conditions, pests and crops diseases while guarantying them a access to a more diversified food diet.

1.4. Current and recent agricultural development initiatives

In more recent years, the Ministry of Environment, Agriculture and Livestock, in collaboration with partners, have developed a number of policy instruments set out in different strategic documents with the aim to mitigate agricultural sector vulnerability to shocks, to boost its profitability, and ultimately to sustain both food security and productive resources base (FAO, 2015).

A. The National Agriculture and Livestock Extension Programme (2005-2010)

In the short and long run, the programme strategies were to: (i) reverse the downward trend in crop yields and livestock production, (ii) mobilise funds and revise the extension service practices, (iii) improve stewardship of resources and develop a sound pricing policy, (iv) increase land productivity for all agricultural commodities, (v) extend the market outlet for agricultural products, (vii) improve product quality in order to increase competitiveness on

both regional and international markets, and (vii) rationally choose new opportunities for investment and create conditions for private investments.

B. The National Agricultural Strategy 2018-2030 and related Action Plan

The policy initiated the following action plans, to: (i) diversify the sources of economic growth and initiate trade liberalization and privatization by improving the quality and competitiveness of production of agricultural commodities, (ii) ensure better control of water management and sustainable use of natural resources, (iii) ensure better availability of inputs for both agricultural and livestock sectors, (iv) seek for necessary means to solve land disputes, (v) strengthen agricultural research and development toward increased productivity, (vi) foster regional specialization of crops and livestock production according to the comparative advantages, (vii) ensure better processing and marketing of agricultural commodities in order to grasp the advantages of regional integration prospects, and (viii) mobilize funding and good coordination of actions.

C. The National Programme for Food Security (NPFS) 2009-2015;

The actions within this programme aimed to: (i) increase crop, animal and fish production through agricultural intensification with new technologies, adapted varieties and input supply, (ii) secure production through water management, soil fertility, environmental protection and conservation of natural resources, (iii) improve producers' income, especially income of women and young farmers, (iv) improve storage systems, marketing and processing of crops and animal products and fish, (v) improve the nutritional status of the population, (vi) to establish and strengthen the monitoring system, warning and rapid response to crises food in vulnerable areas, and (vii) strengthen the farmers' capacity and their support mechanisms.

In addition, the country has joined the Scaling Up Nutrition (SUN) movement in 2013, committing to tackle the alarming levels of malnutrition in the country. Subsequently, the Multi-sectorial Food and Nutritional Security Platform was established with the aim to promote the commitment and accountability among all national stakeholders (public, private and international community) (FAO, 2015).

D. The Farmer Field School (FFS)

Since 2008, the Ministry of Agriculture and Livestock adopted a Farmer Field School approach so as to enable transfer and ownership of agricultural innovations (FAO,2013a)¹. In 2012, the global agriculture and food security programme highlighted the extension and the fostering of technical skills among farmers through establishment of the FFS and local service centres (MINAGRIE, 2012). This participatory training method is mainly supported by FAO and IFAD in several agricultural domains including seed production, protection of catchments, microfinances... (FIDA, 2014).

E. The Comprehensive African Agriculture Development Programme (CAADP)

¹ FAO in action: <http://www.fao.org/emergencies/fao-in-action/stories/stories-detail/en/c/175609/>

In Burundi, the strategic document for this program was approved in 2010. It is based on four major pillars: (i) extension of the area under sustainable land management and reliable water control systems, (ii) improving rural infrastructure and marketing capacities for improved market access, (iii) increasing food supply and reducing hunger and malnutrition and (iv) promoting agricultural research, extension service and adoption of new technologies for sustainable growth in production.

F. Since 2012, the Government of Burundi has adopted a **National Fertilizer Subsidy Programme** (PNSEB) which provides fertilizers to farmers at low prices with the aim to increase agricultural productivity through greater input utilization in the country (MINAGRIE, 2014).

G. Since 2016, the government has adopted a **National Seed Subsidy Programme** (PNSSB). The program consists of the following activities:

- Organization of information, awareness raising and training campaigns,
- Description of varieties,
- Producers registration,
- Choosing contracts for micro finance institutions,
- Commitment of farmers (consolidation of demand),
- Data compilation,
- Choice of seed providers,
- Price subsidy and fixation of the subsidy rate,
- Balance payment,
- Delivery of ordered seeds, etc.

H. Private Seed Sector Development (PSSD).

Started in December 2018, it is funded by the Government of the Netherlands and implemented by International Fertilizer Development Center (IFDC). The PSSD focuses on scaling up emerging commercial seed producers, the professionalization of national seed traders, the unlocking of Dutch and other international private sector expertise to the Burundi seed sector, and the large-scale promotion of quality seed used to grow the market to a stable, self-sustaining commercial sector. The overall goal of PSSD is to assure the availability and use of high-quality seed by the establishment of a commercially viable and self-governing seed sector, supported by client-oriented seed services.

Finally, the Ministry of Agriculture and Livestock has developed a National Agricultural Investment Programme (NAIP: 2011-2016; 2018 - 2022), in order to operationalize these strategies, track investments in the agricultural sector and assess their impacts on rural populations and the government revenue (MINAGRIE, 2018).

1.4. Scope for the development of agriculture

There are substantial opportunities for the agricultural sector development in Burundi. The climatic conditions in most regions of the country are favourable and hence increase the

potential for development in agriculture. Furthermore, the country enjoys abundant water resources as well as potentially irrigable lands (IFAD, 2008). Several opportunities for developing agriculture exist in Burundi and can be summarized as follow:

- A wide range of agro-ecological conditions that allows farmers to grow a diverse range of crops,
- Abundant labour availability,
- Abundant rainfall,
- A very important hydrographic network,
- Fertile land,
- Wide marshland and river valley with fertile land,
- Great possibility to transform traditional extensive into intensive farming;
- Deposits of limestone, dolomitic and phosphate rocks, etc.

1.5. Income source diversification in Burundi

In Burundi, households adopt livelihood strategies to suit their asset endowments, taking into account the constraints of market failures and their exposure to uninsured risks. Their main source of household income has traditionally been sales of crop and livestock products, but faced with an absence of public insurance or stabilization programmes, farmers have devised methods to reduce income fluctuations from both farm and non-farm income sources to acceptable levels (Niragira,2011).

Young farmers with small agricultural holdings often look for work on other people's farms or outside agriculture (Verhaegen et al., 1991; MINAGRIE, 2013). This is because in case of a crop failure, the family's income can be sustained in the short-run through having diverse incomes. Wealthier households engage more in growing cash crops and in non-farm self-employment and less in low-paid unskilled agricultural wage labour (Bundervoet, 2010).

Given the surplus of unskilled people on the African rural labour market, agricultural labour activities are badly paid and are only taken up by poor households (Reardon, 1997). Richer farmers decide on the wages they pay for rural labour taking into account the uncertainty of their production settings (Niragira, 2011). Yet, despite the low level of payment, labour income can be considered 'safe', since it is paid work that does not involve any risky investments (Bundervoet, 2010). Earning income from outside the farm may also be complementary to on-farm work as it allows farmers to keep their family land for basic subsistence production and maintain their social identity (Verhaegen et al., 1991). In most cases, wage income is a way to earn money to buy food (and secure a balanced diet), to renovate the family house or to buy a small plot of land, with no goal beyond simple household survival.

II. CROP PRODUCTION SYSTEMS

2.1. Current crop production levels of major staple food crops: average crop yields

The wide agro-ecological conditions allow a variety of crops grown in Burundi. The table 3 shows the trend in yield of crop cultivated in Burundi.

Table 3: Crop produced in Burundi and their respective yield between 2013 and 2019

Crops	Cropping year 2013-2014			Cropping year 2018-2019		
	Cropped area (ha)	Production (in tons)	Yield (kg/ha)	Area cropped (ha)	Production (in tons)	Yield (in kg/ha)
Maize	97 242	127 829	1 315	270 755	270 813	1 000
Sorghum	32 254	22 354	693	15 809	8 851	560
Rice	23 730	67 377	2 839	53 497	209 245	3 911
Finger Millet	5 254	3 084	587	18 375	10 158	553
Wheat	9 766	5 628	576	7 651	1 894	248
Bush bean	248 944	154 357	620	361 076	312 216	865
Climbing bean	131 318	97 404	742	338 317	325 510	962
Cowpeas	3 120	3 238	1 038	2 358	1 962	832
Peas	6 478	12 389	1 912	6 271	8 967	1 430
Cajanus Cajan	8 396	7 486	892	5 959	3 059	513
Banana	126 215	1 013 955	8 034	102 309	1 179 759	11 531
Cassava (bitter)	256 040	1 848 970	7 221	237 689	1 543 054	6 492
Cassava (sweet)	48 506	393 382	8 110	83 865	571 692	6 817
Sweet potato	66 029	664 217	10 059	93 578	1 023 458	10 937
Potato	24 442	181 209	7 414	53 689	376 441	7 012
Peanut	16 708	9 296	556	14 072	12 436	884
Soybean	4 438	3 648	822	12 868	14 584	1 133
Sunflower	2088	2 056	985	1 667	2 019	1 211

2.2. Description of the country's main agro-ecologies and their cropping systems

The country is divided into 17 provinces and 119² communes (administrative entities) spread over 11 ecological zones that differ in soil, relief, climate, flora and fauna (Bidou et al., 1991). The terrain is hilly with extensive marshlands.

² Burundi has 119 communes with 116 rural communes and 3 urban communes in the mayor ship of Bujumbura.

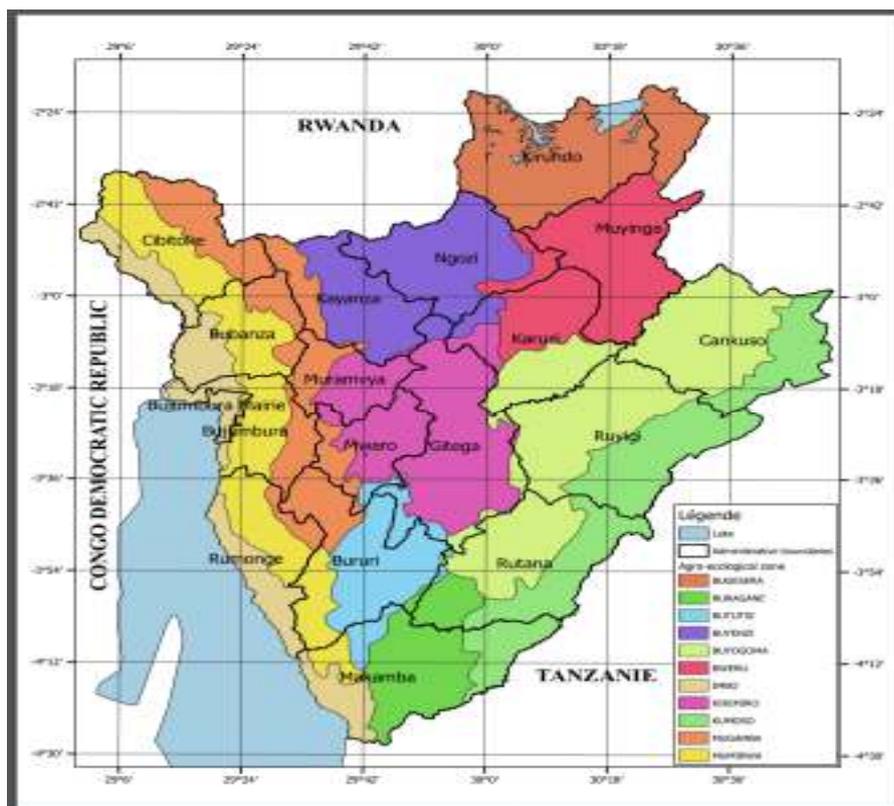
Table 4 : Natural regions of Burundi and their characteristics

Region	Altitude (m)	Climate (Koppen)	Annual rains (mm)	Temperature	Dry season (months)	
1	Imbo	770-1000	Aw4)s	800	>18° C	4 - 5
2	Mumirwa	1000-1750	(Aw4)s-(Cw3)s	1000-1200	>18° C	3 - 4
3	Mugamba	1750-2600	(Cw3)s	1400-2000	<18° C	3
4	Bututsi	1750-2300	(Cw3)s	1300	<18° C	3
5	Buyenzi	1500-1900	(Aw3)s-(Cw3)s	1200	0<18°C<E	3
6	Kirimiro	1400-1750	(Aw3-4)s-(Cw3)s	1250	0<18°C<E	3 - 4
7	Buragane	1400-1800	(Aw4)s-(Cw3)s	1200	N<18°C<S	3 - 4
8	Bugesera	1300-1700	(Aw3)s	1050	>18° C	3
9	Bweru	1400-1750	(Aw3-4)s	1100	>18° C	3 - 4
10	Buyogoma	1400-1800	(Aw4)s-(Cw3)s	1200	SW<18° C	3 - 4
11	Moso	1100-1400	(Aw4)s	1200	>18° C	4

Bidou et al., 1991; Godderis, 1995

The rainfall varies from 2 000 mm at highlands to 800 mm in the lowlands of plains and depressions (MPDRN, 2006; MEEATU, 2011). Yet, since 1999, there is a strong variability in weather patterns. The climate is changing toward longer dry seasons with heavy rains ending early in May rather than June, and starting late in October instead of September (Baramburiye et al., 2013).

Figure 1 : Administrative boundaries and natural regions of Burundi



2

Table 5 : Major crops produced and locations (provinces and natural regions)

Province	Natural region	Major crops
Bubanza	Imbo, Mumirwa, Mugamba	beans, maize, cassava, banana, rice, sweet potato, palm oil
Bujumbura	Imbo, Mugamba, Mumirwa	beans, maize, cassava, banana, rice, sweet potato, palm oil
Bururi	Bututsi, Mugamba	beans, maize, cassava, banana, sweet potato
Cankuzo	Buyogoma, Moso	beans, maize, cassava, banana, sweet potato
Cibitoke	Imbo, Mugamba, Mumirwa	beans, maize, cassava, banana, rice, sweet potato, cotton
Gitega	Kirimiro, Bututsi	beans, maize, cassava, banana, sweet potato, potato, coffee
Karuzi	Bweru, Buyogoma, Kirimiro	beans, maize, cassava, banana, sweet potato, coffee
Kayanza	Buyenzi, Mugamba	beans, maize, cassava, banana, sweet potato, coffee
Kirundo	Bugesera, Bweru	beans, sorgho, cassava, banana, sweet potato, coffee
Makamba	Buragane, Imbo, Moso	beans, maize, cassava, banana, rice, sweet potato
Muyinga	Bweru, Bugesera	beans, cassava, banana, sweet potato, coffee
Muramvya	Kirimiro, Mugamba	beans, maize, cassava, banana, wheat, sweet potato
Mwaro	Kirimiro, Mugamba	beans, maize, cassava, banana, wheat, sweet potato
Ngozi	Buyenzi	beans, cassava, banana, sweet potato, rice, coffee
Rumonge	Imbo, Mirwa	Beans, cassava, rice, sweet potato, palm oil
Rutana	Moso, Buragane, Buyogoma	beans, cassava, banana, sweet potato
Ruyigi	Buyogoma, Moso	beans, cassava, banana, sweet potato

Adapted from ENAB, 2012

2.3. Current status of agricultural extension activities

Agricultural extension activities are coordinated by the General Directorate of Mobilization for Self-Development and Agricultural Extension (DGMAVA) at the Ministry of Environment, Agriculture and Livestock. The Directorate has two main sub-directorates: Directorate of Agricultural Training and Animation and the Directorate of Agriculture and Livestock. It was established in 1992 and the extension services were decentralized to the lower administrative levels, to make them more accessible to the local communities (IFAD, 2008).

Extension activities are decentralized through regional bureau (BPEAE) spread in the 17 provinces. The services provided include: the coordination in input supply, the support and advice in plant, animal and fish production, promoting rural development at the level of the communes, zones and villages or collines. Agricultural and livestock service providers have been deployed in each of the 116 rural communes and 2912 collines.

Extension agents at the commune and zones³ level are agricultural technicians, usually diploma holders while the agents at the colline level have completed primary school and only received moderate training (Collins et al., 2013).

2.3.1. Level of capacity of public extension system

With the socio-political crisis of 1993⁴, public and private structures supporting agricultural production (research, extension, input supply, marketing and credit) were disorganized and lost human resources, infrastructure and equipment. The financial crisis has significantly reduced the operational capacity of services, budget resources being unable to cover their operating needs.

Following these difficulties, the government decided to concentrate its efforts in rural areas in agricultural production, gradually ceding the processing and marketing functions to the private sector in the spirit of liberalization of the national economy initiated during the 1980s with the implementation of structural adjustment programs. Liberalization mainly concerns cash crops (coffee, tea, cotton, oil palm, sugar cane, tobacco, rice, and cinchona). The country proceeded to the dissolution of the regional development societies, the creation and the organization of the Provincial Directions Agriculture and Livestock, the removal of administrative structures from the management of cooperatives, and the privatization of the marketing of coffee and rice while rationalizing State intervention, thus aiming to empower producers and operators in rural areas.

Following the aftermath of the 1993 civil strife that engulfed the country's economy for more than a decade, the Government undertook several reforms including the revitalization of the agricultural sector. In 2005 the Government set up a new institutional engagement in order

³ The country is divided into 17 provinces, 119 communes. Each commune comprises a number of zones which are divided into collines. The colline is the lowest administrative entity.

⁴ A socio-political crisis erupted in Burundi following the assassination of the first elected president which destroyed several resources base.

to revitalize the extension service. Almost 2912 extension agents were recruited, trained and sent to every colline which brought them in walking distances of most farmers. The government was making efforts to improve extension services. Yet, according to Curtis (2013), there is still a long way to go in order to make them more focused on farmers’ real needs. A reorientation of agricultural education towards training sessions to meet national agricultural policy objectives is necessary.

The challenges faced by the agricultural extension system of Burundi (World Bank, 2010; Curtis, 2013; Collins et al., 2013) are as follow:

- Ineffective communication systems,
- Lack of necessary equipment of the extension officers,
- Training is not tailored to specific farmer needs especially women farmers,
- Lack of harmonization of approaches to technological interventions,
- Ineffective linkage of research results with extension services because research findings are not well transmitted to the intended beneficiaries,
- Lack of operational participatory approach and non-functioning farmer organizations,
- Low motivation of extension managers and technicians- lack of effective capacity development and low salaries,
- Inadequate resource allocation to extension services,
- The colline extension agents ought to seek guidance from commune technicians which lowers their performances,
- Little interaction between farmers and commune extension agents,
- Etc.

As a consequence to above limitations, smallholder farmers lack access to extension and research services. The table 6 depicts the number of households who benefited the extension services and applying it in their farm household during the 2018-2019 agricultural year.

Table 6: Household reached by extension services in 2019

	Season A	Season B	Season C
Households reached by extension services (2019)	10.7	18.5	28.5
Households using improved seeds (2018)	6.6	2.2	0.6
Households working in farmers’ associations (2019)	10.2	13.7	11.0

Source: ENAB (2018-2019)

Data in the table 6 show that only 19.2% of farmers surveyed reported to have been reached by extension services in 2019, while 6.6 % have used improved seed in season A, and 2.2% in season B. This situation can be attributed to the ineffective communication systems in extension services, the weak linkage of research systems with extension services as the research findings are not well transmitted to the intended beneficiaries, the lack of operational participatory approach and non-functioning farmer organizations, etc.

Agricultural cooperatives, which could improve the access to credit (World Bank, 2007) and facilitate the skills learning, are not well developed neither as only 11.6 are member of cooperatives. The latter has been put forward since the recent decades in order to improve the farmer's access to productive assets by strengthening their social capital.

2.3.2. Level of activity by non-governmental and private sector entities in agricultural extension of Burundi

In Burundi, extension activities are also provided by Non-Governmental Organizations to a lesser extent. Knowledge and skills dissemination is mainly done through training sessions, model farmers, demonstrations and exchange visits.

Demonstration plots are perceived to be most suitable for most farmers in the collines with low literacy levels. It is easier for the farmers to apply what they observe during demonstrations as opposed to what they hear during trainings.

Yet, level of intervention of NGOs is limited in few provinces while operating for a limited period in time. None NGO is operating in all the provinces of the country or during many years on the same location.

With regard to the participation of the private sector in extension services, it is still almost nonexistent. Only farmers involved in seed production can help (seed and some skills) the farmers operating in their surroundings in order to protect their fields (seed).

Indeed, the development of the private sector is somewhat recent in Burundi. Since decades, many agricultural activities (research and extension) were carried out by the sole public sector. This situation can be attributed, on one hand, to the policy instruments that were not clear for the private investors to step in the system. On other hand, the private sector is meant to make profit which might become highly expensive for smallholder farmers with regard to their low purchasing power.

Recently several promotional policy instruments have been developed and subsidies granted to stakeholders (National fertilizer subsidy program in 2012, National seed subsidy program in 2016...). This has encouraged the private sector intervention, yet this is still low.

The main NGOs contributing to extension services in Burundi are:

A. Confederation of Associations of Agricultural Producers for Development

Confédération des Associations des Producteurs Agricoles pour le Development (CAPAD) is a confederation of producers whose main objective is to train and build farmers' capacity on various technologies based on their specific needs and agro ecological conditions. CAPAD is made up of 107,570 family farm households (62% of which are headed by women) growing food crops, fruit and vegetables and also animal husbandry. These farmers are brought together in 108 cooperatives located in 68 municipalities in 15 provinces. Its areas of intervention are:

1. Intensification of agriculture and livestock,
2. Promoting rural entrepreneurship,

3. Provide support and advice to operators, knowledge management and access to information,
4. Support for capacity building.

B. Cooperation Agency for Research and Development (ACORD)

A Cooperation Agency for Research and Development (ACORD) is an NGO under the IFAD-funded programmes-PRODEFI and PAIVA-B. These programmes focus on agriculture intensification and value chain development. Major activities include: management of marshlands for rice production, rice intensification, banana intensification, livestock intensification, crop intensification, manufacturing agricultural produce, land management-soil conservation, land use optimization. Technicians are deployed at the colline level to foresee implementation of the technologies by the farmers. Agriculture production and land management are integrated in the food security component.

C. NGO Twitezimbere

‘Twitezimbere’ in local language, which means ‘We move forward’, the NGO’s main activities include training farmers on crop production focusing on integrated soil fertility management- use of organic manure and inorganic fertilizers, soil analyses to determine fertilizer requirements, crop spacing, crop varieties, positive seed selection, disease control, seed multiplication and soil erosion control- planting trees and fodder grasses on the contours. Farmers are organized into farmer groups and cooperatives in various communes in which they are trained and provided with inputs such as seeds and fertilizers, more than 4,000 farmers have been engaged. The NGO covers 70% of the input cost.

The NGO works with the government technicians who provide assistance in mobilizing and training farmers. Monitoring and follow up of activities is done during farm visits. The agronomist further collects primary data which shows the farmer opinions and willingness to continue with the technologies.

D. FAO, Farmer Field School (FFSS)

In Burundi, FAO is providing support for the implementation of this approach with a special focus on efforts to build the agricultural and nutritional skills of **vulnerable populations**. FAO also encourages men and women smallholders to share good practices that could help them increase their agricultural production. The focus of FFS is mainly geared on the **consolidation and networking of the existing farmer field schools**, which have served as an excellent basis for running multiple innovative and participatory initiatives.

2.3.3. Level of digital technology usage by extension staff

The level of digital technology usage in agricultural extension of Burundi is very low. It is mainly used for disseminating information using mobile phones. Yet, only wealthier farmers and skilled farmers can get access to it. As indicated in the section 2.3.1., the agricultural extension system of Burundi suffers from many challenges including the following: ineffective communication systems, lack of sufficient funding, lack of necessary equipment of the extension officers, inadequate resource allocation to extension services, etc.

2.3.4. Level of adoption of improved crop varieties, by crop

Agricultural sector of Burundi is organized into small scale family farming units producing mainly for household subsistence. They produce mainly using seed from previous harvest. According to the 2018-2019 National agricultural survey (ENAB), Burundian farmers use very few improved seeds as indicated in table 7. The latter indicates the percentage of improved seed used during the agricultural year 2018-2019.

Table 7: Rate of the use of improved varieties, by crop, in 2019

Cropping Seasons	Beans	Maize	Rice	Potato	Cassava	Banana	Others
Season A	17.2	18.3	19.0	20.0	15.6	11.4	11.6
Season B	13.9	9.7	28.2	18.2	8.1	5.9	4.1
Season C	12.2	14.6	17.7	16.7	5.4	7.2	5.3
Average	14.4	14.2	21.6	18.3	9.7	8.2	7.0

The table 7 shows the rate of improved variety from the national agricultural survey (ENAB, 2019). Among the crop monitored, rice is the major crop that benefits from improved varieties, mostly due to regional development society of Imbo County (SRDI), which provides them with inputs and other technical supports.

Despite the promotional policy on seed production and subsidies, many small scale farmers have little access to it due to the limited purchasing power. Farmers produce on typically small landholdings and the farming system is mainly focused on subsistence activities with only a limited surplus being marketed. They are not motivated to increase production due to limited access on the market. The lack of market infrastructure including an adequate storage facilities and conditioning services complicates post-harvest handling. Agricultural produce is mostly consumed fresh and the surplus is sold at low prices immediately after harvest. Moreover, the extension service is weak which implies that small farmers are not well sensitized to adopt modern inputs.

2.3.5. Level of adoption of climate smart and highly nutritious crops

In Burundi, farmers undertake adjustment actions within agriculture through crop diversification by allocating more land to more productive and resistant crops while adopting other farming practices and techniques (e.g. multiple cropping, planting dates, etc.). Yet this has affected the population diet and ultimately the food and nutrition security in the community (Niragira, 2016). Since decades, there is a trend in farming system toward high dense energy crops but poor in proteins, fat and other micronutrients.

2.3.6. Level of utilization of fertilizers to increase crop yields, by crop

While minimizing food purchases, farmers seek to limit as much as possible the use of external inputs. Therefore, the level of modern input use is extremely low. According to the World Bank report, Burundi is one of countries with the lowest levels of fertilizer use in Africa. On average, only 5.4 kg are applied per hectare of arable land of Burundi (Worldbank, 2016)⁵.

⁵ <http://data.worldbank.org/indicator/AG.CON.FERT.ZS> (last accessed on 12 march 2020)

Table 8: Utilisation of fertilisers among farm household of Burundi (2018-2019)

Cropping Seasons	NPK	Urea	DAP	KCl	Lime	Manure	Others
Season A	6,5	18,8	48,2	1,5	1,7	70,3	1,9
Season B	7,6	8,6	49,5	2	0,9	68,2	1,3
Season C	1,7	4	17,3	1,3	0,2	32,4	0,1
Average	5,27	10,47	38,33	1,6	0,93	56,97	1,10

Source: ENAB (2018-2019)

Farmers rely mostly on organic fertilizers produced within their compounds as almost 57% used manure in 2019. Despite the National Fertilizer Subsidy Programme (PNSEB) providing fertilizers to farmers at low prices, the rate of chemical fertilizer use is very low. The low purchasing power of the farming population is the major barrier, along with limited farmer awareness.

Since 2012, the Government of Burundi has adopted a National Fertilizer Subsidy Programme which provides fertilizers to farmers at low prices with the aim to increase agricultural productivity through greater input utilization in the country (MINAGRIE, 2014). Yet only wealthier households can afford to buy fertilizers or to take out loans to pay for these modern inputs.

However, there is hope to increase the chemical fertiliser use since the country built its own industry to manufacture fertilizers since 2017. FOMI is a fertilizers company producing organo-mineral fertilizers which benefits from the subsidy program in Burundi.

2.4. General description of the current system for marketing surplus production of staple crops

Despite the fact that agriculture is mostly subsistence oriented with limited marketable surplus, every farmer still needs to generate some level of income for basic household daily needs (school fees, cloths, salt, oil, soap...). Indeed few farmers can be considered as purely market oriented. Farmers mainly sell their produce individually. They can sell on fields, to intermediaries, in the nearby markets places, etc.

Households can sell their crops early in the field in order to meet urgent needs. This type of sale is often used on perennial crops such as banana and coffee. The sale can take place at any stage of the plant's development. The buyer and the farmer agree on the price. The sale before harvest can be also practiced, at lesser extent, on other crops such as onion, rice, cassava, sweet potato, potato, etc.

For the marketing system of collection from producers, the farmer sells his production to collectors or intermediaries after the harvest. In this case, the price is not higher enough. Prices are very low during the harvest season especially for perishable products.

Finally, the farmer can sell his production on a local market and often the nearest market. He surely gets a better price than in the case of sales on field or after the harvest because he has access to more buyers and better pricing information.

Today, the trend in produce marketing is done on a collective basis. In this arrangement, smallholders farm produce or sell through farmer cooperatives. This system empowers them as they can negotiate the price on the market and therefore decrease transaction costs.

2.5. Food security situation

In Burundi, the majority of the population lives in rural areas (90%), of whom almost 64.5% subsist on an income below the national poverty line (ENSNMB, 2018). The population pressure contributed to land fragmentation, undermining small-scale farm productive capability and overall food security (Verschelde et al., 2012). The per capita agricultural production has been declining for years with obvious implications on food and nutrition security (Baghdadli et al., 2008, WFP, 2014).

The 2014 Global Hunger Index report classified Burundi among the countries in an extremely alarming situation (IFPRI, 2014). Per capita food production declined by 24% between 1993 and 2014 (WFP, 2014). According to the recent National Survey on Nutritional Situation and Mortality, the prevalence rate of acute malnutrition is 4.5% while that of chronic malnutrition is 57.0%, with 25.6% in its severe form (ENSNMB, 2018).

2.6. Food supply in cities of Burundi

Food supply in Burundi is mainly assured by local production of staple foods. Farmers produce mainly for household subsistence. On average, a household consumes 72% of the farm production while 28% is marketed and/or to a lesser extent exchanged through social networks.

Cities are the main centers for agricultural production marketing. Staple food products are shipped from the countryside to cities where prices are more remunerative for farmers. The most consumed dishes include mainly: rice, beans, cassava and maize porridge, banana, meat, etc.

They are complemented by the food imports from other countries. The country imports mainly from the east African countries around 17% and 83% from the rest of the world including China, Saudi Arabia, India, United Arab Emirates etc.

Table 9: Major food commodity imports in Burundi (kg)

HS Description	2017	2018	2019
Wheat	82 594 452	81 139 791	118 514 349
Maize	49 134 550	45 934 739	22 983 939
Sugar cane	26 293 942	25 988 431	23 563 990
Malt, whether or not roasted.	17 175 036	19 492 463	13 814 579
Rice	27 913 966	15 636 978	16 904 351
Palm oil and its fractions,	6 439 073	13 987 571	10 868 368
Cereal flours other than of wheat	12 063 300	10 810 523	7 848 740
Roots of cassava,	3 874 307	8 533 822	4 288 098
Dried fish,	2 876 752	5 196 848	3 146 406
Flour of wheat	6 426 975	5 029 620	259 585
Peanuts not roasted or otherwise cooked, whether or not shelled or broken.	1 342 317	2 429 372	2 296 749
Bakery products,	1 948 832	2 099 107	1 959 771
Tomatoes prepared or preserved otherwise than by vinegar or acetic acid.	706 255	1 095 809	883 229
Fruit juices (including grape must) or vegetables	841 618	857 823	614 072
Malt extracts;	1 068 772	783 369	2 636 556
Live animals of the bovine species.	1 173 210	682 000	38 100

On the other hand, Burundi exports food products to other countries including mainly United Arab Emirate, Democratic Republic of Congo, Pakistan, Switzerland, etc.

Table 10: Major food commodity exports from Burundi (kgs)

HS Description	2017	2018	2019
Flour of wheat	15 876 190	17 728 025	18 392 945
Coffee	13 292 952	17 425 177	22 737 908
Tea	10 202 212	10 371 387	10 076 874
Sugar cane	4 600	200 000	
Milk and cream, concentrated or containing added sugar		66 621	72 000
Fruit, fresh.	35 605	64 058	62857
Palm oil	27 153	31 814	20 797
Milk and Cream	455	15 674	9 960
Sunflower seeds, whether or not broken	298 290	8 000	23 400
Dates, figs, pineapples, avocados, guavas, mangoes fresh or dried.	4 479 204	1 600	5 000
Potatoes, fresh or chilled.		800	
Oils of sunflower,	1336	750	0
Cabbages, cauliflower		684	1900
Dried Fish	800	583	30
Live fish	3000	500	
Other vegetables, fresh or chilled.	240	400	

Bananas, Including Plantains, fresh or dried.	746 160		
Onions, shallots, garlic, leeks and others	74 440		

There is a great possibility for import substitution in Burundi. Burundi imports many food commodities that can be produced easily in Burundi. Crops like rice, wheat, sugar cane, maize, etc. are grown in Burundi with a very high potential to increase their production.

III. STATUS OF SEED SUPPLY IN BURUNDI

3.1. Introduction

Seven systems can be distinguished in the seed sector of Burundi (ISSD, 2012):

First, **the family seed system** is characterized by traditional seed production and preservation practices, with bartering and marketing on local markets. This system is the basis of a large share of the agricultural production in Burundi. It is used for household subsistence and to generate income, with the exception of coffee, tea and exotic vegetables.

Second, **the community seed system** is made up of farmers' organizations which are supported by NGOs through emergency projects. These farmers' organizations produce seeds which are distributed or sold at a special rate among members, while the surplus is sold locally or sold to NGOs who normally redistribute it. This system mainly uses improved varieties on food and cash crops.

The third system is associated with **private seed producers**. These are progressive farmers who specialize in the production and sale of food and cash crops' seeds for locally improved and imported varieties. This system combines both individual private entrepreneurs and the public services that support and work with them, in order to increase the availability of quality seeds and certified.

The fourth system is based on a **free distribution chain associated with humanitarian programs**. The seed comes from informal sources and is distributed for emergency use. This system focuses on improved local varieties of food and cash crops for the different seed quality classes.

The fifth system is based on **rapid vegetative multiplication by tissue culture in vitro**. This system often concerns bananas, potatoes and taro. Rapid multiplication is carried out by private or public laboratories. In this system, the seed sector is rather small. It includes the production and acclimatization of seedlings which are then distributed to farmers or sold to farmers or specialized multipliers.

The sixth is the **formal seed system**, which is based on a public-private partnership. Seeds of different categories are produced and distributed to farmers through public structures (national seed services). This system is based on project funding. It includes the production of improved varieties and the production of certified seeds.

The seventh and final seed system **targets perennial cash crops such as coffee and tea**. Planting material is checked by researchers and then distributed to producers.

3.2. History of crop breeding and seed supply in the country

3.2.1. History of crop breeding in Burundi

Crop breeding is not a common practice in Burundi, even in more specialized institutions. In the last decades, it was carried out by Faculty of Agronomy (FACAGRO) at University of Burundi. ISABU had made some essays but a lesser extent in the late 1980s on beans breeding.

Before the start of crop breeding in Burundi, the crop improvement process was mainly based on selection of existing varieties. The main institution to carry out these operations was the ISABU. The Institut des Sciences Agronomiques du Burundi (ISABU) was founded in 1962 to take over the research activities that were done by INEAC (Institut National pour Etude Agronomique du Congo-Belge, Rwanda-Urundi). ISABU assumed a long tradition of tropical agricultural research that was initiated in 1929 under the colonial authority at Gisozi station.

Seeds of new varieties were imported and then submitted to tests of adaptability and agronomic performance in different stations of this institution. Thus, the so-called “improved varieties” were then released by the ISABU to the Provincial Offices of Agriculture and Livestock (DPAE), which delivered it to farmers.

The main commodity programs are wheat, rice, maize, sorghum, irish potato, sweet potato, cassava, beans, ground nut (peanut), soybean, peas, fruits and vegetables.

The situation changed when the Chinese rice variety ‘YUNYIN 3’, tolerant to cold stress, was almost completely devastated by rice blast in Buyenzi Region marshes in the second half of the 1980s (Nizigiyimana, 1990). This failure, which occurred half a decade after the first trials of rice cultivation in the mid-altitude marshes (1300-1700 m), with the aim to extend rice cropping areas, triggered the Government’s decision to assign a mission to the FACAGRO to solve the problem.

Therefore, the faculty (FACAGRO) adopted a breeding/crossing program in 1986 in order to produce new varieties with both tolerance to cold stress and resistance to rice blast. A number of rice varieties under the acronym FACAGRO were then released until 2000. Since then, some breeding activities on different crops, are carried out by the Faculty of Agronomy.

Since 2013, a large scale breeding program on rice crop was undertaken by the International Rice Research Institute in East and South Africa (IRRI-ESA), which started as the project IRRI-FACAGRO in 2009.

Meanwhile, ISABU conducted the breeding activity with different breeding programs:

- On wheat in 2014,
- On beans in 2017,
- On sweat potato in 2018,
- On maize in 2018.

3.2.2. History of seed supply in Burundi

Before the establishment of the National Seed Quality Control and Certification (ONCCS) and the current Seed Law, seed certification was done by ISABU. In ISABU, the seed production and control program started in 2007 using transitional seed standards provided by the East African Community for quality control in the field and using ISTA rules for laboratory testing.

Improved seed were mainly produced by ISABU and FACAGRO (rice for mid-altitude marshes) and then transmitted to the different regional agricultural offices (DPAEs). The latter were in charge of supplying farmers with improved seeds. To avoid domination of seed provision by wealthy farmers these institutions relied mainly on farmers' associations. It was therefore very rare to have single person's seed production demand accepted from the DPAEs.

3.3. Recent and ongoing activities aimed at release of improved crop varieties, by crop

Several measures have been developed on both policy and research in order to improve the quantity and quality of variety releases. Since 2016, the government has adopted a National Seed Subsidy Programme (PNSSB) in order to strengthen the functioning of the seed sector.

In order to allow the operation of the seed subsidy system and the payment of ordered seeds, a Common Seed Fund will be set up and funded by the government and its partners supporting the seed sector. In addition, the choice of crops benefiting the subsidy is guided by the orientation of the government policy in terms of development of agricultural sectors in order to develop crops ensuring food security for the majority of the Burundian population. This grant relates to 7 priority crops which are: maize, beans, cassava, potatoes, bananas, rice and fruit trees.

3.4. Recent and ongoing activities aimed at increasing supply of improved seed

In Burundi, the demand for seeds is always higher than its availability. To alleviate these problems the government has re-launched the seed program by updating seed legislation and the national seed plan, support for the implementation of seed production at three levels: strain seeds and pre-basic seed production by ISABU, basic seeds production by the decentralized extension services (BPAE), and commercial seeds production by multiplier groups assisted by DPAE. The legislation has recently been promulgated by the competent authorities with all the texts governing it.

In order to improve seed availability in Burundi, several activities have been undertaken:

In 2012, a law on the organization of the seed sector was signed with the aim to:

- Create a framework to enhance the development of the seed sector in order to produce high quality agricultural seeds in sufficient quantity;
- Promote the participation **of private operators** in the production and marketing of quality seeds;
- Create an institutional system for varietal homologation and seed certification system;

- Develop international cooperation in the seed trade.

Today, following national legislation, the National Seed Quality Control and Certification (ONCCS) is active, and private seed producers can operate as associations or individuals. In this framework, the Private Seed Sector Development (PSSD) started its activities aiming at scaling up emerging commercial seed producers, the professionalization of national seed traders, and the large-scale promotion of quality seed used to grow the market to a stable, self-sustaining commercial sector. The project has made some essays on producing hybrid maize.

3.5. Current options for smallholder farmers to access improved seed

In Burundi, smallholder farmers can access improved seed through purchases on the market from seed producers or shops.

Farmers can also get access to seed through the community seed system made up of farmers' organizations and supported by NGOs through emergency projects. The seeds are often distributed or sold at a special rate among members, while the surplus is sold locally or sold to NGOs who normally re-distribute it.

Farmers can get seed through a free distribution channel associated with humanitarian programs. The seed comes from informal sources and is distributed for emergency use.

Finally, farmers can get seed from the formal seed system which is based on a public private partnership. Seeds of different categories are produced and distributed to farmers through public structures (national seed services). This system is based on project funding.

3.6. Number of private seed companies operating in the country and their estimated annual supply

With the 2012 seed act private companies are encouraged to invest in the agriculture sector in order to increase the capacity in variety research and development, and to produce sufficient quantity and high quality seed. The Collectif des Compagnies et Coopératives de Production des Semences du Burundi (COPROSEBU) is equivalent to the Burundi Seed Trade Association and has been active in the seed sector since 2010 (ASI,2018). It is a group of private growers involved in the production of certified seeds.

Table 11: Leading seed companies in Burundi

Company	Status	Crops	Countries
COPROSEB-Nyunganira	Private	Field crops, local crops	Burundi
ISABU	Public	Field crops, vegetables, local crops	Burundi
SRDI	Public	Field crops (rice)	Burundi
NASECO	Private	Field crops (maize)	Burundi, Uganda, DRC
SOBUPRODIA/SEED-COM	Private	Field crop (maize)	Burundi, Tanzania
AVET	Private	Field crops, vegetables	Burundi
UHACOM	Private	Vegetables	Burundi

Beside the COPROSEBU and COPROSEB-Nyunganira, five other companies are considered more dominant in Burundi: Société Régionale de Développement de l'Imbo (SRDI), NASECO, AVET, and UHACOM. SRDI is a public seed company with an exclusive focus on rice seed production. AVET does not produce seeds but imports seeds from neighboring countries. The national research institute ISABU also plays an important role in the Burundi seed sector.

Most of the above-mentioned companies operate exclusively in Burundi, whereas NASECO operates in Burundi, Uganda and Democratic Republic of the Congo. NASECO carries out breeding activities from a research station in Uganda. One season's production assay in Burundi in 2018 was not successful. SOBUPRODIA operate with SEED-CO, which produces hybrid maize in Tanzania. None of the other leading companies in Burundi has a breeding program. In 2019⁶ IFDC also started some trails. Companies use pre-basic seeds from ISABU that are then multiplied. UHACOM works with Haguruka Popular University (UPH) in conducting crop trials and making selections.

Table 12: Private seed companies and their estimated annual supply (kg)

Company	2016				2017				2018				2019			
	Potato	Beans	Maize	Hybrid maize	Potato	Beans	Maize	Hybrid maize	Potato	Beans	Maize	Hybrid maize	Potato	Beans	Maize	Hybrid maize
AVET	0	0	0	23570	0	0	0	40194	0	0	0	14300	0	0	0	24000
COPROSEB	132200	0	360	0	74000	4500	0	0	55000	19400	0	0	83000	316800	0	0
NASECO	0	0	0	60000	0	0	0	73955	0	0	0	43000	0	0	0	0

Most of these private companies employ the farmers' associations to perform their activities in rural areas. COPROSEB is reported to employ more or less 360 persons depending on the season. The CEO of COPROSEB (Nimpagaritse Léonidas) declared that almost three fourths of his staff are female (270 women and 90 men).

⁶ The results are not yet registered in ONCCS.

3.7. Other non-governmental and farmer-based organizations active in seed production and supply

In Burundi, seed producers are working as individuals, farmer’s organizations or NGOs. Most of them still mix seed production with other farming activities. NGOs also support farmers working in the seed production sector by providing either technical support or simply financial assistance. The major contributors are: World Vision, CAPADE, UCODE, Reseau 2000+, PNSADR, ZOA, PAIVAB/FIDA, PRODEFI/FIDA, Fondation STAM, PROVAPA, CRS, PRDAIGL.

Table 12 presents the number of individual or farmer’s organizations involved in seed production. The data was provided by the National Seed Quality Control and Certification (ONCCS). According to the 2012 seed act, the certification of seed has to go through two stages (field inspection and laboratory check). Moreover, there is a list of varieties which are mandatorily submitted to certification. The crop varieties which are voluntarily submitted to certification are not presented here due to the absence of a clear framework that could make a database on seed used, seed producers, seed import, etc.

Table 13: Evolution in seed producers of Burundi

Crops	2016		2017		2018		2019	
	Field checked producers	Lab checked producers						
Beans	160	129	140	84	192	138	290	198
Rice	65	36	58	45	85	59	81	62
Maize	110	55	149	89	227	117	270	159
Peanut	28	25	33	30	24	12	14	10
Soybean	2	0	2	2	4	4	5	3
Wheat	5	5	14	8	21	11	5	5
Sorghum	0	0	1	0	2	2	1	0
Potatoes	153	85	136	98	135	90	151	122

This table 13 provides the number of all seed producers monitored by the ONCCS during the four years. But, if we consider the most recent cropping year (2019) and the production quantities obtained, we can identify the main active producers for each crop variety involved in seed certification process. Tables 14-19 provides both a list of actives seed producers and their locations.

Table 14: Main active seed producers for rice (2019)

	Producer	Location	Produced quantity (Kg)
1	Coop Kazoza keza mubikorwa /SRDI	Bubanza	145 249
2	Coop.Urumuri mw'Iterambere/SRDI	Bubanza	102 500
3	Coop.Bwiza bwa Ninga/Urumuri mw'Iterambere	Bubanza	96 325
4	Coop.Dukorerehamwe/Nitegetse Gédéon/ISABU-PRODEFI	Bubanza	29 926
5	Ass.Sangwa Umwimbu/Gahungu Berchmans/ISABU PRODEFI	Ngozi	27 023
6	Ass.Twijukiruburimy/ Ntisezerana Léa/PAIVA-B	Kayanza	15 780
7	Ass.Twiyunge/ISABU PRODEFI	Karusi	13 425
8	Ass.Twizamure/ISABU PRODEFI	Karusi	9 960
9	Ass.Girumwete Murimy/PAIVA-B	Karusi	9 850
10	Ass.Twitegurirerekazoza/Sinzotuma Frédéric/PAIVA-B	Kayanza	9 590
11	Ass.Kazozakeza/ISABU-PRODEFI	Bubanza	8 623
12	Ass.Turwizimbuto/Nyandwi Gérard/PAIVA-B	Kayanza	6 339
13	Nyamweru Samuel/PNSADR-IM	Rutana	5 600
14	Ass.Turwizimbuto z'Umuceri/ISABU PRODEFI	Ngozi	5 309
15	Ass.Dushigikire Uburimye/ISABU PRODEFI	Karusi	5 261
16	Ass.Ejoniheza/PAIVA-B	Karusi	4 850
17	Ass.Twunguranubwenge/PAIVA-B	Karusi	4 781
18	Ass.Turwanyinzara/Nduwimana Claudine/PAIVA-B	Kayanza	4 269
19	Nzirubusa Alfred/PNSADR-IM	Rutana	4 200
20	Ass.Twerekanubuhinga/Nyandwi Gasilde/ISABU PRODEFI	Ngozi	4 185
21	Ass.Terimberemurimy/PAIVA-B	Karusi	3 780
22	Ngendakumana Etienne	Bubanza	3 500
23	Ass.Turwizimbuto z'Umuceri/Gakobwa Généviève/ISABU PRODEFI	Ngozi	3 476
24	Ass.Kundibikorwa/Ngendakumana Philbert/PAIVA-B	Kayanza	3 431
25	Ass.Shugikira Igiterwa c'Umuceri/ISABU-PRODEFI	Kayanza	3 370
26	Ass.Twitezimbere/PAIVA-B	Karusi	3 327
27	Ass.Turwanyinzara/Barusasiyeko Etienne /ISABU PRODEFI	Ngozi	3 269

Total **540,525 kg**

Here, we arbitrarily considered 3,000 kg as the lower limit. The western, the northern and the middle regions are the most represented. Only two cases from southern Burundi (Rutana) are recorded while the eastern part is not represented. This could be explained by the large plain of Rusizi in the western part, and the relatively large marshes in the northern part and in central provinces which are well suited to rice production.

Table 15: Main active seed producers for maize

Producers		Location	Produced quantity (Kg)
1	GPC Tuzamururimy/Minani Jean Prime	Rutana	45 000
2	Hatungimana Richard	Rutana	41 966
3	Coop.Twungubumwe/Hatungimana Jean/PRDAIGL	Rumonge	30 000
4	Kabirori Régine	Kirundo	20 400
5	ISABU (Gisozi, Munanira, Karusi)	Mwaro, Gitega, Karusi	15 730
6	Nkurunziza Jean Claude/UCODE-AMR/CSUB	Rutana	13 760
7	Barungura Jean/Société NAJ Training Company/Habarugira Fidélité	Gitega	12 000
8	Nkeshimana Sicaire	Karusi	11 800
9	Manirakiza Alexis alias Wajama	Makamba	11 100
10	Urunani Ishaka/Ndayikengurukiye Elie	Karusi	10 067
11	CMVIA	Ngozi	10 000
12	Sayukubara Serges	Muyinga	10 000
13	Gateranya Emmanuel/PROVAPA	Makamba	9 100
14	Congrégation des Apôtres du Bon Pasteur (CABP)	Karusi, Gitega	7 000
15	Nyamoya Béatrice	Bubanza	4 782
16	Nayabagabo Nestor	Muyinga	4 500
17	Niyokwizera Marie Rose	Karusi	4 500
18	Bakame Pancrace	Muyinga	3 800
20	Niyonkuru Michel	Cankuzo	3 700
21	Yamuremye Emmanuel	Bururi	3 500
22	Gatabazi Jean	Kirundo	3 250
23	Baragasirika Chartiel	Ruyigi	3 200
25	Ass.Inguvu za Bose/Ngaruye Téléspore/PNSADR-IM	Cibitoke	3 050
26	Ciza Jean	Ruyigi	3 025
27	Coop.Terimberemurimy/Sezirahiga Juvénal	Kirundo	3 000

Total **288,230 kg**

For this crop, the western region is less represented than are others. This could be the aftermath of a recent maize borer invasion in that region. The lower limit was fixed to 3 000 kg as well.

Table 16: Active seed producers for wheat

	Producer	Location	Produced quantity (Kg)
1	Hatungimana Athanase alias Cokoroko	Bururi	8 645
2	ISABU Munanira	Kayanza	5 130
3	Biha Suzane	Muramvya	2 800
4	Butoke François	Bururi	1 200

Total **14,975 kg**

These four producers are the only farmers who entered the certification process for wheat in 2019. They are from south, north and center of the country. However, there is something common to their cropping zones: they are all highlands (Bututsi and Mugamba), almost the only operators in Burundi growing wheat.

Table 17: Main active seed producers for bean

	Producer	Location	Produced quantity (Kg)
1	COPROSEB-Nyunganira ⁷	Mwaro, 7 others	19 400
2	Ass.Tezimberimbuto/Mugabo Pasteur	Muyinga	17 453
3	Gatabazi Jean	Kirundo	8 850
4	Hatungimana Richard	Rutana	8 380
5	Ntirampeba Mariette	Muyinga	5 500
6	CABP;Congrégation des Apôtres du Bon Pasteur	Karusi	4 549
7	Coop.Tubehoneza/Nshemezimana Claude	Makamba	4 446
8	Niyokwizera Marie Rose	Bururi	3 440
9	Nimubona Maurice	Bururi	2 921
10	Biha Suzane	Muramvya	2 635
11	Kagayo Jeanne d'Arc	Karusi	2 583
12	Nahimana Annick	Mwaro	2 511
13	Paroisse Munanira/Abbé Déo Nitunga/World Vision	Muramvya	2 395
14	Nahimana janvière	Ngozi	2 316
15	CDLK -Kiryama	Bururi	2 250
16	ASSOPRO Buramata/Kamanayo Marius	Bubanza	2 227
17	Coop.Kazozakeza/FAO	Bubanza	2 025
18	Nayabagabo Nestor	Muyinga	1 800
19	Bakame Pancrace/CRS	Muyinga	1 750
20	Nduwimana Alexia	Mwaro	1 600
21	Ass.Terimberemurimyji/Sezirahiga Juvénal	Kirundo	1 500
22	Niyokindi Jean	Muyinga	1 500
23	Rwasa Régina Paccis	Muyinga	1 500
24	Ass.Akarorero/Manirakiza Alexix allias Wajama	Makamba	1 318
25	Ndike André/UCODE-AMR/PADASIO	Cankuzo	1 020
26	Sabuwatsinze Michel/CRS	Muyinga	1 000

Total **106,869 kg**

The lower limit for beans was fixed to 1000 kg. In fact, the bean is the most important staple crop among legumes produced in Burundi. However, its production is lower than that of main cereals such as rice and maize. Here again, the eastern region is missing. Explanation is that there are many seed producers for beans in this region, but are producing small quantities. Most likely, the seed production associations (bean) are less developed in this part than elsewhere in the country.

⁷ COPROSEB is based in 8 provinces of the country

Table 18: Active seed producers for soybean

	Producer	Location	Produced quantity (Kg)
1	CMVIA	Ngozi	4500
2	Centre de Développement de Bugenyuzi/CEDEBU/Bahebura Dismans	Karusi	2089
3	Ndihokubwayo Domitien	Ngozi	1838
4	ISABU Murongwe	Gitega	1255
5	Coopérative Twijukiruburimy/PNSADR	Cibitoke	916
6	Hatungimana Athanase alias Cokoroko	Bururi	850
7	Njyobiri Antoine/PNSADR-IM	Ruyigi	800
8	Nyamoya Béatrice	Bubanza	719
9	Ciza Jean	Ruyigi	500
10	Hakizima Léonie	Bubanza	450
11	Ass.Twiyungunganye/PNSADR-IM	Rutana	410
12	Hatungimana Richard	Rutana	401
13	Nijimbere Richard	Ruyigi	150
14	Nyandwi Félicien /PNSADR-IM	Rutana	105

Total **14,983 kg**

All the five are regions are likely represented for this crop. Its production is nonetheless very low compared to that of beans.

Table 19: Active seed producers for peanut

	Producer	Location	Produced quantity (Kg)
1	Ngizizmana Gad	Bujumbura	300
2	Nyawenda Bonaventure/UCODE-AMR/CSUB	Ruyigi	262
3	Nyandwi Célestin/UCODE-AMR/CSUB	Ruyigi	251
4	Toyi Astérie/UCODE-AMR/CSUB	Ruyigi	204
5	Habonimana Protais/UCODE-AMR/CSUB	Ruyigi	159
6	Manirakiza Françoise/UCODE-AMR/CSUB	Ruyigi	118
7	Bizindavyi Oswald/UCODE-AMR/CSUB	Ruyigi	100
8	Ntiruhava Félix Simon/UCODE-AMR/CSUB	Ruyigi	58
9	Ndihokubwayo Pascal/UCODE-AMR/CSUB	Ruyigi	40

Total **1,492 kg**

Peanut seed production is less developed than soybean if we refer to the number of producers, produced quantities and the cropped area. It is produced in two zones only (west and east).

Table 20: Main active seed producers for potato*Pre-basic seed*

	Producer	Province (Region)	Produced quantity (Kg)
1	ISABU (Gisozi, Mahwa, Mwokora, Nyakararo)	Mwaro, Gitega, Cibitoke	386261
2	AGRINODE	Bururi	146000
4	COPROSEB	Mwaro	47000
5	Mbonankira Charles	Ngozi	10000
6	Nimubona Maurice	Bururi	5875
7	Butoke François	Bururi	4055
8	CDLK Kiryama	Bururi	3364
9	Niyonizigiye Marie Rose	Bururi	1063

Basic seed

	Producer		Produced quantity (Kg)
1	Association Twiyunge	Kayanza	188 000
2	AGRINODE	Bururi	164 000
	Niyungeko François	Bururi	110 526
3	PASS-Kajondi	Bururi	95 731
4	Déo Guide Rurema	Kayanza	69 686
5	Simenya Diomède (Association Imbanzaguseruka)	Kayanza	61 000
6	Manirakiza Thérance	Ngozi	48 000
7	Ntiharizwa Christine	Bujumbura	48 000
8	Gnl Ndirakobuca Gervais	Cibitoke	47 749
9	Ndayiziga Alice	Mwaro	45 000
10	BPEAE Kayanza	Kayanza	41 500
11	Association Dufatanemunda	Mwaro	39 224
12	AGROSERVE	Kayanza	36 784
13	COPROSEB	Mwaro	36 000
14	BPEAE Mwaro	Mwaro	32 178.5
15	Ass.Twiyungunganye	Kayanza	26 324
16	Hatungimana Athanase	Bururi	25 000
17	NDARUVUKANYE Zénon	Bujumbura	24 963
18	CADAP Rwira	Bururi	23 300
19	Nahimana Gabriel	Bujumbura	20 000
20	Nduwimana Alexia	Mwaro	19 000
21	Ndimuribo Simon	Mwaro	18 290
22	Nahimana Anick	Mwaro	18 000
23	CODECI Niyonzima Jeanine)	Kayanza	16 600
24	CEDEBU-Bugenyuzi	Karusi	12 245

Total**1,264 Tonnes**

Potato seed production involves many farmers, the reason why they are even many to enter the seed certification process. Producers for pre-basic seeds were distinguished from those of basic seeds. As the potato is grown in highlands and mid-altitude lands only, it is reasonable that plain regions and other low lands are not represented.

3.8. Level of entrepreneurial capacity of average seed company owners

As mentioned above, the COPROSEB is a seed company led by Nimpagaritse Léonidas as the Chief executive Officer. The company employs 360 persons yearly, among them 270 are females. The company is involved in potato, maize and bean seed production over 12 out of 17 provinces. The capacity of COPROSEB can be summarized in the table 20.

Table 21: **Capacity of COPROCEB Seed Company**

Assets		Size or comment
1	Land for seed production	COPROSEB uses the land of its partner farmers. The latter are supplied with inputs (seed, fertilizers,...) and sell the production to COPROSEB
2	Infrastructure	<ul style="list-style-type: none"> - Building (under construction in Gitega, capital) - Laboratory (will be included in the building under construction) - Vehicle (1 cars for CEO and 1 four wheel driver for field activities)
3	Productive assets	1 tractor
4	Personnel	20 permanent member staffs (including 2 Bachelor diploma holders, 15 secondary diploma holders, etc.)
5	Capital investment	500 000 000 BIF (yearly), on average 270 000 USD

3.9. Facilities and equipment available for seed processing and packaging in the country

Seed processing and packaging activities are on charge of producer/dealers under the control of the ONCCS. The ONCCS’ aim is that each producer-dealer would set a specific packaging with his/her own personal information. However, progress in this direction is still very weak. First, the packaging manufacturing in Burundi is very recent and most of the packaging bags are still imported from abroad.

Seed processing activities are mainly carried out manually in Burundi with some exception at the IRRI-SA where there is a threshing machine and a winnower seed cleaner.

Recently, small maize and bean sheller machines were locally manufactured under the supervision of ISABU and are sold to anyone who is willing to buy it. Some forms of mechanical maize and beans shellers, invented by individuals under assistance of some NGOs, are also in use.

3.10. Tonnages of seed certified and marketed in the past four years, by crop

The table 22 depicts data from ONCCS on certified seed for eight (8) crops during four years (2016-2019). These data include all the seed categories produced in Burundi. The number of producers is provided in table 12 and includes both individuals and organizations, while the main active ones by crop can be checked in tables 13 to 19.

Table 22: Evolution in seed production in kg (2016-2019)

Crops	2016		2017		2018		2019	
	Produced quantity)	Approved quantity	Produced quantity	Approved quantity	Produced quantity	Approved quantity	Produced quantity	Approved quantity
Bean	86 413	84 513	95 121	94 671	166 462	165 564	880 552	879 508
Rice	120 534.5	113 034.5	200 071	199 884	37 7112	375 826	626 460	619 110
Maize	110 752	109 449	15 3560.5	148 077.5	25 3370	231 193	469 257	401 132
Peanut	10 215	8 772	12 432	10 886	3 030	3 030	1 808	1 492
Soybean	3 811.5	3 479.5	1 697	1 697	7 159	6 258	14 983	14 983
Wheat	36 047	36 047	18 224	18 224	26 204	26 204	17 775	17 775
Sorghum	0	0	0	0	3395	3 395	0	0
Potatoes	1 878 847	1 376 248	1 986 571	1 742 593	2 588 791	2 192 002	3 243 986	2 926 436

With the figures of Table 22, the general trend is that certified seed production is increasing in Burundi. This situation can be attributed to the national program on seed subsidy drafted in 2016, encouraging the private sector to operate in the seed production chain. It shows the potential of the seed sector in Burundi.

3.11. Number of agro-dealers currently in operation, by region

Despite the adoption of several seed policy documents, the presence of a commercial seed sector is limited. Most of the seed produced is marketed by their respective producers. The department in charge of seed at the Ministry of Environment, Agriculture and Livestock could not provide us with an exhaustive list of registered agro-dealers.

The department of crop improvement at ISABU provided lists of some agro-dealers. Yet these were found as seed producers also. Therefore, most seed producers are selling their seed. Among those seed traders, some are organized in associations while others act as companies (AVET which is selling hybrid maize seed from NASECO based in Uganda) or sell seeds as individuals. AVET has five selling points of hybrid maize seed in Burundi (Gitega, Bujumbura, Cibitoke, Bururi and Kayanza).

Agro-dealers, including Selemani, reported to hold business during the agricultural seasons. He can sell between 1 to 2 tons of hybrid maize from Uganda. Note that most of these single agro-dealers are not recognized by ONCCS but are members of groups officially recognized. Table 23 provides some of the officially recognized agro-dealers.

Apart from those dealing with imported seeds, agro-dealers are the same producers. The situation is so established for almost all the crops involved in seed certification except maize, for which hybrid seed is provided from neighboring countries. Therefore, we have exclusive agro-dealers in a low number, and a large one for producers/agro-dealers.

Despite the fact that certified seed prices are fixed by the competent authority at 1 500 BIF, hybrid maize is sold at 5 000 BIF due to transaction costs endured by the traders. Selemani declared that he can only make a profit margin of 1 000 BIF per kg of maize seed.

Table 23: Recognised exclusive agro-dealers

Agro-dealers	Province (Region)	Traded quantity (kgs)
SOBUPRODIA//SEED-COM	Kayanza	200 000
Société Fatale Alliance et Idéale/PANNAR/Budeba Serges	Bujumbura	100 000
Société EAST AFRICAN SUPERMARKET/NASECO	Kayanza	50 000
OAF -Tubura Asbl//PANNAR	Gitega	24 068
AVET BUJA/NASECO	Bujumbura-Kayanza	24 000
Rupereza Célestin/PANNAR	Bujumbura	3 000
COFGN/NASECO/Emery	Bujumbura	2 500

It is remarkable that we have only one exclusive agro-dealer company recognized by the ONCCS against 6 associations/organizations. Indeed, this type of business (seed import and marketing) requires heavy investment, and with a lot of risk.

NASECO has been operating in Burundi since 2013. The first round of importation of hybrid maize occurred in 2015. As impact, the production of maize increased from 160 713 kg in 2015 to 243 740 kg in 2016 and 270 813 kg in 2019 (ENAB, 2019). Hybrid maize is highly appreciated by farmers in Burundi. Yet many farmers are not aware of it or have some limitations in adopting the variety in their farms. The company has set up a system of extension service to train people (clients) who buy seed on how they can handle it. Ten agricultural agents are working in different provinces of the country (Ngozi, Gitega, Rumonge, Bubanza, Karusi, Makamba, Kirundo, Rutana, Bujumbura and Kayanza).

Among other challenges facing NASECO, the contact person identified high market competition with non-registered companies, difficulties in conducting breeding programs due to the higher costs, and the registration of the varieties by ONCCS and recognition by ISABU.

3.12. Level of importation of certified seed from neighboring countries, by crop

The Department of Promotion of Seeds and Plants (DPSP) which is responsible for implementation of the seed acts at the Ministry of Environment, Agriculture and Livestock is trying to reorganize the seed sector. Yet some aspects of the seed chain are still difficult to control.

International organizations and non-governmental organizations (NGOs) are still dominating the seed sector by distributing emergency seed to vulnerable people and farmers’ associations for seed production or for direct consumption. The seed system based on a free distribution chain associated with humanitarian programs for example use seed from informal sources and is distributed for emergency use.

Moreover, the movement of seed of crops that are not included on the list of mandatory certified is very difficult to trace. Burundi imports also most of the seed fruits and vegetables but these are not on the list of certified seed.

Table 24 : Importation of certified seed in Burundi

Crop/seed	2016	2017	2018	2019
Hybrid maize	129 303	238 853	151 095	403 568
Beans	174 340	0	0	0

The importation of seed crops is mainly done by NGOs and is directed towards seed emergency which is distributed to vulnerable people for one cropping season and for direct consumption. It is difficult even impossible to get statistics data of imported seeds by NGOs.

3.13. Average income/turnover of agro-dealers/merchants

Based on information collected, from agro dealers, on average 2 tons of seed can be sold as the seed market depends on the agriculture seasons. Using the price applied by the hybrid maize sellers, the annual turnover of an agro-dealer can be estimated at 2000 kg times 5000 BIF which is 10 000 000 BIF. By subtracting the capital used which is estimated at 4000 BIF, the benefit margin is estimated at 2 000 000 BIF (1 063 USD).

3.14. Average annual turnover (in\$) of seed companies

The average income of seed companies can be calculated using the figures of table 11. COPROSEB produces 83 000 kg of potato seed and 316 800 kg of beans seed in 2019. Using the prices fixed by the competent authority of the MINAEGRIE, one kg of beans seed is sold at 1600 BIF while potato seed is sold at 1400 BIF. Therefore the annual turnover of COPROCEB is 116 200 000 BIF from potatoes and 506 880 000 BIF from beans which amounts 623 080 000 BIF or **331 425 USD**.

3.15. Summary of prospects for improving seed supply

While the country is facing a shortage in seed supply, the Government of Burundi has decided to revitalize the seed sector in order to improve the seed supply system both in term of quality and quantity. The seed act was enacted in 2012 by the President of the Republic, while the country has developed a National Seed subsidy program in 2016. In addition, the bodies in

charge of seed quality control and certification were established. Among others policy instruments on seed legislation and regulations that has been drafted and signed:

- Decree n°010/032 of 1993 on development of national crop and variety catalogue, certified seed commercialization and seed quality control;
- Ordinance n°710/500 of 1999 on the establishment of the National Seed Service;
- Ordinance n°710/501 of 1999 on the composition and function of the National Seed Council;
- Decree N°100-251 of 2012 on mission, composition and functioning of the national seed commission;
- Decree N°100/305 of 2012 on creation, mission, organization of the national office of seed quality control and certification in Burundi;
- Law N°1/08 of 2012 on seed sector organization in Burundi;
- Ordinance N°710/183 of 2015 on accreditation system in seed certification in Burundi
- Decree N°100/55 of 2016 property right protection in crop sector Burundi;
- Ordinance N°710/450 of 2016 on seed certification system in Burundi;
- Ordinance N°710/338 of 2016 on commercialization of certified seed in Burundi;
- Ordinance N°710/339 of 2016 on criteria of accreditation of certified seed producers in Burundi;
- Ministerial decision N°710/379 of 2018 on seed prices of different categories in Burundi.

Therefore, private seed producers have been encouraged to integrate the sector in order to increase the country seed supply. Today, several farmer's organizations and individual farmers are working in the sector, a number of NGOs are supporting farmers operating in the seed productions. Moreover, an increasing number of companies are getting interested in seed production and commercialization.

Finally, there is a clear collaboration between public and private organization in the seed sector of Burundi and this is encouraged by several policy instruments especially the National Development plan (PND-Burundi 2018-2027). In this regard, several financial and technical partners are encouraged to provide support to the seed sector such as FAO IFAD, PAM,IFDC...

IV. NATIONAL AGRICULTURAL RESEARCH SYSTEM

4.1. Introduction

Agricultural research institutions whose mission is to develop and facilitate the transfer of agricultural technological innovations in Burundi are: the Institut des Sciences Agronomiques du Burundi (ISABU), the Agronomic Faculty (FACAGRO) of National University of Burundi and the International Rice Research Institute (IRRI), the private university of Ngozi (UNG) and the “Institut de Recherche Agronomique et Zootechnique (IRAZ)”. The latter is a research institution for the three countries of the Great Lakes Countries (Burundi, Rwanda, Democratic Republic of Congo); yet is no longer active in research since the recent years. It declined completely during the period of the civil wars (1993) which affected the three member countries.

4.2. Description of the public institutes and universities actively engaged in crop breeding

4.2.1. The public agricultural research institution (ISABU)

ISABU is the leading agricultural research institute in Burundi, which started activities in 1962. The main mandates of the crop research and development programs are to introduce, develop varieties, conduct performance and adaptability trials in different agro-ecological zones and disseminate the new and appropriate technologies. The Table 24 shows different locations of ISABU research sites and crops.

Table 25: Location of the ISABU research centers and seed production

Research Centers	Ecological zones	Area (ha)	Potential crops
1. Gisozi	Mugamba	15	Irish potato, maize, wheat
2. Nyakararo	Mugamba	25	Irish potato, maize, wheat
3. Munanira	Kirimiro	8	Irish potato, maize, wheat
4. Mwokora	Mugamba	35	Irish potato, maize, wheat
5. Mahwa	Bututsi	30	Irish potato, maize, wheat
6. Imbo centre	Imbo	40	Rice, Maize, Sorghum, Cassava, Sweet potato
7. Mparambo	Imbo	8	Rice, Maize, Sorghum, Cassava, Beans, Sweet potato, Soybean, Ground nut
8. Murongwe	Kirimiro	15	Maize, Sorghum, Cassava, Beans Sweet potato, Soybean, Ground nut
9. Ndebe	Kirimiro	3	Rice
10. Gasaka	Bugesera	2	Rice
11. Bukemba	Low lands	50	Rice, Maize, Sorghum, Cassava, Sweet potato, Beans, Soybean, Ground nut

Source: ISABU

ISABU is organized into three Departments, one for research and two for technical support to research. The Research Department is made up of more than 6 Research Programs, among others the Crop Production. The latter is in charge of variety improvement and seed production.

With regard to scientific personnel, the ISABU scientific personal involved in variety and seed production is summarized in the table below.

Table 26: ISABU scientific personnel engaged in crop improvement (number per crop)

Crop	PhD	MSc.	BSc.	A2	A3
Beans	1	2	2	6	0
Macadamia	0	0	1	2	0
Soybean-peanut	0	0	1	1	0
Maize	0	1	1	3	0
Rice	0	1	2	4	0
Sorghum	0	1	0	0	0
Wheat	0	0	1	2	0
Cassava	0	0	2	1	0
Potato	1	1	2	5	0
Sweet potato	0	2	1	2	1
Banana, fruits & vegetables	1	2	0	5	0
Coffee	0	1	2	5	0
Cotton & Stevia	2	0	0	0	0
Palm oil	0	0	1	0	0
Tea	0	0	0	1	0
Plant genetic resources	0	0	1	3	0

a. Infrastructure

i. Laboratories

- ISABU has five laboratories, located in different zones:
 - The **Agricultural Chemistry Laboratory** (LCA) performs analysis of soil, food products, plants, water, livestock feed, chemical fertilizers and peat. It analyses samples on behalf of ISABU research teams, but also for clients outside the Institute (MINAGRIE, universities, private companies, NGOs). LCA has acquired recently new equipment such as a gas chromatograph, an enzyme sugar analyser, an extractor and a filtration unit for fibre content determination, Kjeldahl analyzer with distillation unit. This will allow to initiate new analyzes such as the detection and quantification of pesticides, environmental analyzes and quality control of food products.
 - The activities of the **Plant Pathology Laboratory** are mainly focused on the identification of plant pathogens, fungal and bacterial origins by microbiological

analysis, the detection of potato viruses by the DAS-ELISA test, the detection of potato vascular bacteria (*Ralstonia solanacearum*) by the NCM-ELISA test, detection of cassava viruses (Cassava Mosaic Disease and Cassava Brown Streak Disease) and others by molecular analysis (PCR and RT-PCR).

- **The Entomology Laboratory:** Here activities revolve mainly around the identification of crop pests and stored foodstuffs. These identifications constitute the basis of biological and integrated control methods. With the acquisition of the modern insectarium equipped with equipment for the collection and conservation of insects, ISABU is developing a reference collection which will welcome trainees from other countries of the sub-region.
- **The Plant Biotechnology Laboratory** of Gisozi carries out the micro-propagation activities of vegetatively propagated crops (in vitro culture) such as potatoes, sweet potatoes as well as the maintenance in vitro of germplasm. The laboratory also has the capacity to work on cassava, banana and colocase/taro. The laboratory plans to develop activities on the in vitro culture of ornamental and agro-forestry plants, viral sanitation, the introduction of in vitro mutations and improvement of cultures with the acquisition of new equipment on order.
- The Internal **Seed Quality Control Laboratory** performs field controls. The inspections are staggered according to the phenological phases of the plants: before, during and after flowering or heading and during the harvest. It performs quality checks on seeds in stores. Stores and seed lots are regularly inspected to maintain the quality of seeds acquired in the field through integrated management of seed stocks in stores. Seed lots from approved fields are sampled and analysed in the laboratory.
- Germoplasm conservation room, a room with deepfreezes. Copy of the crop kept in the germoplasm room is transferred to Switzerland for security purpose.

ii. Greenhouses

- There are three types which normally complement the work of the biotechnology laboratory.
- ✓ **Conventional greenhouses:** The acclimatization of vitro-plants is done by using the soil as a supporting material.
- ✓ **Hydroponic greenhouse:** The vitro-plants are fixed in channels where a soft current of water charged in nutrients insures their provision.
- ✓ **Aeroponic greenhouse:** The vitro-plants are fixed on boxes, the root part pendent in the box hollow part, so that they can be provided with nutrients by an automatic spray system.

4.2.2. Faculty of agronomy , university of Burundi (FACAGRO/FABI)

Currently called the Faculty of Agronomy and Bio-Engineering, FACGRO has as its ancestor the Agronomic Institute of Rwanda-Urundi which was created in 1958, in Rwanda. This institute was part of the Faculty of Agronomy of the Official University of the Belgian Congo and Rwanda-Urundi. After the independence of the Congo, the Agronomic Institute of Rwanda-Urundi was set up as an autonomous institution and transferred to Usumbura in September 1960.

The faculty targets to respond to farmers' aspirations through research focused on the real needs of the population: availability and dissemination of crop and animal material adapted to agro-ecological conditions, development or adaptation of farming techniques and practices, socio-economic studies to better understand the constraints of farmers.

- The faculty conducted a crossing program on Burundi mid-altitude rice through which were created some new varieties under the acronym FACAGRO.
- This institution is composed of five Departments:
 - Rural Socio-Economy,
 - Animal Health and Production,
 - Sciences and Plant Productions,
 - Food Science and Technology,
 - Environmental Sciences and Technologies.
- The department of Sciences and Plant Productions is the most involved in crop improvement. Yet, its activities require other departments' contributions.

a. Scientific personnel

The Department of Sciences and Plant Productions, which is directly involved has its human resources below depicted:

Table 27: FACAGRO scientific personnel engaged in crop improvement

Staff category	Number of staff	Specialization
PhD	4	2 in Plant Pathology
		1 in Plant Physiology
		1 in Plant Breeding
MSc/under doctoral School	4	1 in Plant Pathology and Weeds
		1 in Molecular Biology of Bacteria and Plant Production
		1 in Plant Genetics and Breeding
		1 in Crop Improvement
BSc.	1	Agronomist
Technician	2	Agricultural technicians

b. Infrastructure

- Infrastructure that supports the crop improvement activities is made of laboratories. They are numbered to four, but very poor on equipment:
- **The Plant Pathology Laboratory** contains just some old optic microscopies among which, only one can be used currently.
- The **Soil Analysis Laboratory** performs analysis of soil properties. Its equipment is worn out, with a great number of non-working materials.
- The **Plant Biotechnology Laboratory** used to carry out the micro-propagation activities of vegetative propagated crops (in vitro culture). The laboratory is not working currently due to the lack of project funding. Many of the material items are not working properly anymore; they are not up-to-date, or have been damaged and repaired in a wrong way. For example: an ELISA Kit that no longer works just for lack of set up.
- **The Microbiology Laboratory** helps to much the department in lab analysis activities, even if it is not its proper lab. The reason is that this lab was recently equipped with a new material as a National key lab for food analysis.
- Two other small labs are used for teaching matters. The greenhouse which used to receive vitro plants for acclimation, is no longer serving.

c. Land property

The faculty operates on two sites (Bujumbura and Gitega) with some plots scattered in different provinces of the country. Overall more than 200 hectares of land are owned by the faculty and used for educational and seed production purposes (some plots are being used by IRRI).

4.2.3. Nature of recent or ongoing crop improvement activities, by crop

Currently, ISABU is conducting the breeding activity on four crops under different breeding programs:

- On wheat in 2014,
- On beans in 2017,
- On sweet potato in 2018,
- On maize in 2018.

On the other hand, FACAGRO, today known as FABI is conducting breeding on rice and wheat. In addition, the faculty is actively collaborating with the International Rice Research Institute (IRRI). Moreover, the faculty has recently initiated some programs on seed production (sweet potatoes, maize, and potatoes). Everything is intended to be technically supported, in the near future, by new and up-to-date lab equipment, the order of which is an already advanced project.

4.3. Recent or ongoing collaborations with public institutions, farmer-based organizations, and private sector in seed supply

The recent seed subsidy program indicates clearly the roles of all the stakeholders in the seed sector. ISABU and the other research institutions have the roles of keeping the germplasm, selecting the promising varieties, producing the description of the available varieties and supplying the pre-basic varieties of the varieties in time. The private individuals involved in seed activities have roles of producing pre-basic seeds, basic seeds, certified and participating in the supply market of ordered seeds. The different partners are called upon to support the seed sector both technically and financially.

4.4. Current status of crop variety licensing arrangements for production of seed by third party entities

Admission to certification is obtained following a request to the national seed control and certification office by the seed producer using an appropriate form issued by the ONCCS. The request for admission to certification is followed by a verification visit if the fields intended for the production of seeds meet the required conditions. A reasoned response to the acceptance or refusal of admission is given within 15 days. The next step will be laboratory analysis on germination, homogeneity and humidity parameters.

Anybody or any seed testing laboratory associated with field inspection, sampling, seed testing or activities of independent bodies wishing to obtain an authorization must have access to advice and information from the services of the National quality seed control and certification (ONCCS). ONCCS requires all people to maintain their competence, to be informed of changes to technical certification regulations, technical procedures and the authorization system and for their training to be timely and appropriate.

V. NATIONAL SEED POLICY FRAMEWORK

5.1. Introduction

In Burundi, the development of seed systems dates back to 1985. It started with the drafting of a national seed program which was presented in 1987. The first decree on seed production and trade was promulgated in 1993. It emphasized four main components:

- Developing a national catalog of crops and varieties;
- Improving the production, import and commercialization of certified seeds;
- Developing a seed control and certification system;
- Identifying the roles of all partners in the seed value chain.

In 1999, the Ministry of Agriculture and Livestock signed a series of ordinances applying measures to the above decree. Following national legislation, the National Seed Quality Control and Certification is active, and private seed producers can operate as associations or individuals.

Today, the National Seed Policy framework is reflected by the connection between seed producers and the regulatory agencies, by the policy documents that define this relationship.

It is implicitly described in the Burundian Seed Law N°1/08, enacted by the President of the Republic in 2012. This clarifies how the information is set and disseminated to all the stages of the seed system.

With regard to the major stakeholders in the system, one can distinguish the following:

- The Minister in charge of Agriculture and livestock, because all the system is under his control. Therefore, the Minister is the top-head of the System, whose role is the monitoring for the perfect accomplishment of the National Seed Plan (Plan National Semencier: PNS);
- The National Seed Council (Commission National Semencière: CNS). Established by the Presidential Decree (the update Decree N° 100/251 of September, 2012). The CNS is the highest body advising for general supervision, regulation and coordination of all seed activities in the country;
- The National Variety Release Technical Committee (Comité Technique National d'Homologation des Variétés : CTNHS), that acts as a technical support to the CNS;
- National Seed Quality Control and Certification (Office National de control et de Certification des Semences: ONCCS);
- Finally, the seed producers, who play an important role in seed supply at the first degree.

Other documents in regard are as follow:

- Ordinance N°710/183 of 2015 on accreditation system in seed certification in Burundi
- Decree N°100/55 of 2016 property right protection in crop sector Burundi;
- Ordinance N°710/450 of 2016 on seed certification system in Burundi;
- Ordinance N°710/338 of 2016 on commercialization of certified seed in Burundi;
- Ordinance N°710/339 of 2016 on criteria of accreditation of certified seed producers in Burundi;

5.2. Documents which control the production and supply of seed

The Burundian Seed Law N°1/08 is the main document of reference for understanding the Burundian Seed System. It specifies the documents and procedures used to control the production and supply any kind of seed.

5.3. National catalogue of crops species and varieties

The Burundian Seed Law N°1/08 establishes a National Catalogue of crop Species and Varieties, where are registered crop species and varieties grown in Burundi.

5.3.1. Variety registration procedures

To be registered in that catalogue, a variety has to be distinct, stable and homogeneous enough.

The Catalogue has two different lists:

- A list of ancient and new varieties, registered under the demand of a breeder, public administrations, or other persons interested in its registration, and with the three important characteristics of distinction, stability and homogeneity;
- B list made of varieties traditionally grown, registered under the demand of breeders, users or public administrations, and with distinction characteristics with existing varieties.

The Minister of Environment, Agriculture and Livestock appoints the National Variety Release Technical Committee (CTNHV), which releases varieties according to characters established by a ministerial ordinance.

5.3.2. Main crop varieties involved in seed certification

When we compare the information from the ONCCS database about seed certification with the current National Catalog of Species and Varieties of Burundi, we find that some varieties in use are not registered. This is relevant to the fact that the Catalog was authored in 2016 and the varieties are taken from data of 2019 cropping year. A session to update the Catalog is planned in the near future.

Those varieties were released but not yet registered. So, they are recognized by the ONCCS, and thus equally submitted to certification regulations as the registered ones. Tables 27 to 34 highlight the main varieties involved in seed certification process.

For some crop species (beans, rice and potato), the list of varieties used during the cropping year 2018-2019 is long, therefore only the major varieties were considered. In the following tables, the varieties of different species are listed in decreasing order of production quantities.

Table 28: Main varieties of rice involved in seed certification

Variety	Date of release	Breeder/Importer	Origin	Kirundi name	Growing area (altitude)	Yield (tons per ha)
V564-2-7	2002	ISABU	ISABU (crossing at Ndebe)	Kabuye	1200 to 1700	3 to 6
IR87/Kazosi		IRRI	IRRI-ESA			
Murwiza						
L 662-3-9	2007	ISABU	ISABU	Kigingi	1200 to 1700	5 to 6
IR79511-47-2-6-5	2011	IRRI-ESA	IRRI Philippines	Gwizumwimbu	800 to 1000	7
IR13/Musesekara						
WAB2099	2015	ISABU	AFRICA RICE	-	800 to 1000	4 to 5.6
Musesekara						
L699-1-1	2007	ISABU	ISABU	Nyagatwenzi	1200 to 1700	5 to 6
V18						

Table 29: Main varieties of maize involved in seed certification

Variety	Date of release	Breeder/Importer	Origin	Kirundi name	Growing area (altitude)	Yield (tons per ha)
ZM621	2006	ISABU	CYMMIT Zimbabwe	-	800 to 1800 m	3 to 4
ZM605-24	2006	ISABU	CYMMIT Zimbabwe	-	1200 to 1800 m	3.5 to 4.5
Ecavel-1	2006	ISABU	CYMMIT Kenya	-	800 to 1200	4 to 5
Isega 1	1987	ISABU	Local (Burundi)	Isega	1200 to 2200 m	2 to 3
Elite 89	1996	ISABU	CYMMIT Zimbabwe	-	1200 to 1800 m	2 to 3
Mugamba-1	1987	ISABU	CYMMIT Mexique	Mugamba	1200 to 2200 m	2 to 3

Table 30: Varieties of hybrid maize involved in seed certification

Variety	Date of release	Breeder/Importer	Origin	Kirundi name	Growing area (altitude)	Yield (tons per ha)
SC513						
PAN 53	2013	PANNAR SEED	PANNAR SEED-SA	-	800 to 1700 m	10 to 11
Longe10H	2013	NaCRRRI	NASECO Seed-UGANDA	-	1200 to 1700 m	6 to 10
Bazooka						

Table 31: Varieties of wheat involved in seed certification

Variety	Date of release	Breeder/Importer	Origin	Kirundi name	Growing area (altitude)	Yield (tons per ha)
YT 12						
11th HRWYT12	2010	ISABU	CYMMIT Mexico	-	1800 to 2600	2.5 to 4
BW 385	2004	ISABU	CYMMIT Mexico	Kigori	1800 to 2600	2 to 3
SN 64						

Table 32: Main varieties of bean involved in seed certification

Variety	Date of release	Breeder/Importer	Origin	Kirundi name	Growing area (altitude)	Yield (kg per ha)
MAC44	2015	ISABU	CIAT	Magorori	Mid altitude	1800 to 2000
CODMLB003	2015	ISABU	CIAT	Mutwenzi	Mid altitude	1200
Mukungugu	2008	ISABU	ISABU (Local: Burundi)	Mukungugu	1400 to 2200 m	1.5 to 1.8
IZO 201245	1999	ISABU	IRAZ (Loca: Burundi)	Inamunihire	800 to 2200 m	500 to 1200
Kinure	--	--	--	--	--	--
RWR 2245	--	--	--	--	--	--
Musengo	--	--	--	--	--	--
Msole	2011	INERA-Mulungu	INERA-Mulungu	Musole	Mid altitude	500 to 1200
KATX 69	--	--	--	--	--	--
Muhoro	2013	ISABU	ISABU (Local: Burundi)	Muhoro	Mid altitude	2000 to 2500
RWR 2154	--	--	--	--	--	--

IZO 2015110	2013	ISABU	CIAT	-	Mid altitude	1000 to 1200
VCB 81013(Urwera)	--	--	--	--	--	--
Bisera	--	--	--	--	--	--

Table 33: Varieties of soybean involved in seed certification

Variety	Date of release	Breeder/Importer	Origin	Kirundi name	Growing area (altitude)	Yield (tons per ha)
Yezumutima	1993	RAB (ISAR)	RAB-Rwanda	Yezumutima	Mid altitude	1.5 to 1.8
Soprossoy	2008	RAB (ISAR)	RAB-Rwanda	-	800 to 1800	2.5
Bossier	1993	ISABU	INTSOY	-	Mid altitude	1.2 to 1.5
Peka6	2008	RAB (ISAR)	RAB-Rwanda	-	800 to 1800	3.5

Table 34: Varieties of peanut involved in seed certification

Variety	Date of release	Breeder/Importer	Origin	Kirundi name	Growing area (altitude)	Yield (tons per ha)
ICG7-9127	2004	ISABU	ICRISAT	-	800 to 1800 m	1.5 to 2.5
ICGVSM 70907	2004	ISABU	ICRISAT	-	800 to 1800 m	1.5 to 2

Table 35: Varieties of potato involved in seed certification

Variety	Date of release	Breeder/Importer	Origin	Kirundi name	Growing area (altitude)	Yield (tons per ha)
CIP 01						
CIP 03						
Ingabire	1993	ISABU	CIP	Ingabire	1400 to 2200	25 to 30
Kinya-Mpya						
Mabondo	2004	ISABU	CIP	Mabondo	1400 to 2200	25 to 30
Magome	2004	ISABU	CIP	Magome	1200 to 2200	25 to 30
Ndinamagara	1985	ISABU	CIP	Ndinamagara	1200 to 2200	15 to 20
Ouganda 11	1985	NARO (Uganda)	CIP	Uganda 11	1800 to 2200	25 to 30
Victoria	1998	NARO (Uganda)	CIP	Victoria	1400 to 2200	25 to 30

5.4. Documents for seed quality control and certification

The National Seed Quality Control and Certification (ONCCS) is currently responsible for seed quality control. The National Seed Law stipulates that field control, sampling and lab analysis activities are conducted according to the rules of the International Seed Testing Association (ISTA). On the other hand, the quality control and certification standards are established, as annexes, in the ordinance for seed certification system in Burundi, by the Minister of

Environment, Agriculture and Livestock, on suggestion of the ONCCS and after advice of the CNS.

5.5. Process for the official release of improved crop varieties

a) Introduction

Referring to the National Seed Law, entering the seed certification system is a voluntary action. Every seed producer who want join the official system of seed certification can introduce a demand to the ONCCS. Only approved seed producers can have their seeds into the certification procedures. The conditions for seed producers to be approved as official seed producers are specified in the ordinance for seed certification system in Burundi (currently the ministerial ordinance N° 710/450 of April 4, 2016). The ONCCS is in charge of the conditions' check and approval.

The Minister, advised by of the CNS, determines which varieties to be mandatory submitted and which ones to be voluntarily submitted to certification. Currently, the situation is as follow:

- ❖ Compulsorily submitted to certification varieties:
 1. Beans, *Phaseolis vulgaris* L.;
 2. Maize OPV (open pollinated varieties), *Zea mays* L.;
 5. Maize Hybrid varieties, *Zea mays* L.;
 3. Rice OPV, *Oryza sativa* L.;
 6. Rice Hybrid varieties, *Oryza sativa* L.;
 4. Peanut, *Arachis hypogaea* L.;
 5. Cotton OPV, *Gossypium hirsutum* L.;
 7. Cotton Hybrid varieties, *Gossypium hirsutum* L.;
 6. Wheat, *Triticum aestivum* L.;
 7. Sunflower OPV, *Helianthus annuus* L.;
 8. Sunflower Hybrid varieties, *Helianthus annuus* L.;
 8. Sorghum OPV, *Sorghum bicolor* (L.) Moench;
 9. Sorghum Hybrid varieties, *Sorghum bicolor* (L.) Moench;
 9. Soybean, *Glycin max* (L.) Merr,
 10. Potato, *Solanum tuberosum*.
- ❖ Voluntarily submitted to certification varieties:
 1. Cassava, *Manihot esculenta*;
 2. Taro; *Colocasia antiquorum*,
 3. Sweet potato, *Ipomea batatas*.

This second group encompasses varieties for which tests are carried out only in field, for seed supply to seekers who made orders before. It is important to note that the seeds mentioned here are specifically:

- Tubers for potato;
- Cuttings for cassava and sweet potato;
- Vitro-plants for taro;

The seed classes submitted to certification are:

- ✓ Pre-basic seeds
- ✓ Basic seeds
- ✓ Certified seeds of first generation
- ✓ Certified seeds of second generation

Seed certification requires both field and lab check by the ONCCS.

b) Field check

The current ordinance for seed certification system in Burundi established parameters to be controlled in crop fields for seed certification. They are as follow:

- The minimum field area;
- The minimum previous cropping season;
- The isolation distance;
- The maximum off-type plants in % or m²;
- The minimum number of inspections;
- The diseases.

c) Lab check

For seed lab analysis, the same document mentioned the following parameters:

- The minimum germination;
- The minimum pure seeds (or contamination degree);
- The maximum of humidity level.

These analysis parameters are expressed in %.

For seed lab analysis, the ONCCS has a national laboratory for seed quality analysis. When the results of lab seed quality analysis are available, they have to be sent to the Burundi National Bureau of Standards (BBN) for confirmation.

d) Certification fees

The seed certification gives rise to a payment of a fee whose amount and terms are specified in a joint ordinance of the ministers in charge of Agriculture and Finances respectively. Any failure to pay the fees will result into the withdrawal of the approval.

5.6. Procedures for seed certification

The current regulatory agency (ONCCS) in charge of seed certification is somehow young if we refer to its official activities beginning. The ONCCS was established by ministerial ordinance N° 100/305 of November 19, 2012. The results of inspections were reported for the first time in the electronic database in 2015.

5.6.1. Active personnel

The ONCCS personnel, as shown in the table below, is made up of a general manager, four directors, and nine others executive staff. Collaborative personnel are twelve technicians, and the execution staff is numbered to five persons.

In the event of intense activities, the institution sometimes uses the contractual staff in the conduct of field inspections, seed sampling including labeling and closing of the packaging as well as the management of seed testing.

Table 36: The ONCCS personnel

Unit	Grade	Executive Management (DG)	Administrative and Financial Management (DAF)	Seed Homologation and Regulation Management (DHVRS)	Regional Seed Inspection Management (DIR)	Management of the Seed Analysis Laboratory (DLAS)
Management Unit	MSc.	1	0	0	0	0
	Ir/BSc.	-	1	1	1	1
Other officers	MSc.	0	0	0	0	0
	Ir/BSc.	0	2	2	0	5
Collaboration Unit (Technicians)	A2	1	1	1	7	2
	A3	0	0	0	0	0
Support Unit (drivers & others)		0	5	0	0	0

5.6.2. Infrastructure

Regarding the ONCCS’ infrastructure, there is two main buildings and a small warehouse. One of the two buildings serves as the Office, while the other constitutes the seed testing laboratory.

This lab has two sections, namely the section for seeds’ pathogen analysis, and the section for seed physical quality analysis. The situation of this could be summarized as shown in the following table.

Table 37: Situation of the ONCCS laboratory

Equipment	Pathogen analysis Section	Physical quality analysis Section
	<ul style="list-style-type: none"> • Kit ELISA • PCR equipment • Reagents and accessories 	<ul style="list-style-type: none"> • Seed humidity sensors • Incubators • Ovens and desiccators

		<ul style="list-style-type: none"> • Other accessories
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5.6.3. Current status of basic (foundation) seed supply

In Burundi, the basic (foundation) seeds for crop production are the three last classes, namely the basic seeds, certified seeds of first and second generation. Most of the foundation seed production activities are carried out by farmer's organizations on collective plots, and individual farmers who decide to invest in seed production. The other part is a matter of private companies and public institutions.

Most of these farmer's organizations still rely either on public seed centers non-repayable land loans and/or technical assistance, or NGOs for technical assistance and/or financial aid often on equipment or infrastructure such as seed sheds. They have often some training sessions on producing seeds. Rarely, they can get support as transport means (motorbikes or bicycles).

Table 38: Annual foundation seed production (in kg) from 2016 to 2019

	Crops	2016	2017	2018	2019
Locally produced seed	Potato	889 625	1 392 817	1 830 485	2 291 818
	Maize	76 736	115 896.5	205 499	402 476
	Rice	89 741.5	181 063	366 743	613 760
	Sorghum	0	0	3 395	0
	Wheat	25 000	3 639	11 864	12 645
	Beans	80 958	87 676	157 344	1 021 984
	Peanut	84 12	10 562	2 630	1 492
	Soybean	2 579	1 101	5 228	13 728

It is important to know that basic seed are normally used to produce certified seeds of first generation. However, sometimes they are directly sold to crop producers due to the lack or delay in demand from producers of certified seeds. Certified seeds of first generation are intended for crop production. Nonetheless, when the demand is not sufficient, they are multiplied to give certified second generation.

5.7. Procedures for production and supply of basic (foundation) seed

Even if the production of basic seeds is ensured by both private and public bodies, it is mainly handled in a private manner.

5.7.1. Access by private seed companies to basic seed

The access to seeds certification system is completely free. The only requirement is to comply with regulatory rules. They are specified in the ministerial ordinance for seed marketing. The later stipulates that the seed trader or seed producer-trader would sell his/her product to any buyer.

The only remaining problem here is the conviction of farmers to use certified seeds. Most of them rely on self-produced seeds, levied on previous season crop production. We have to admit that mobilization in this area is not yet at an advanced stage.

5.7.2. Policies for supply of basic seed by private sector

The supply of basic seeds is regulated by ministerial ordinance No 710/338 of March 9th, 2016. According to this ordinance, every agro-dealer or producer-dealer has to comply with five conditions that will allow buyers, after packaging, to know the nature, the variety homogeneity, the origin, and the season of production, the sanitary condition, the weight and size of seeds. It means that certified seeds are sold in labeled packages. Repacking is only authorized for vegetable, under the ONCCS supervision in agreement with the Burundi Bureau of Standards (BBN). After the approval, the agro-dealer or the producer-dealer have to declare to the ONCCS and the Seed and Plant Promotion Department (DPSP) his/her stock of seeds before the beginning of every cropping season.

VI. SUMMARY AND CONCLUSIONS

6.1. Current status of access to improved seed among smallholder farmers

In Burundi, agricultural sector is dominated by smallholder family farming units producing mainly for household subsistence by using little external input. The level of access on improved seed is very low. According to the results of the national agricultural survey in Burundi, on average 6.6 % of farm households used improved seed during the agriculture season A, while only 2.2 % used it in the cropping year 208-2019. This situation can be attributed to low purchasing power of farmers, the unavailability of improved seed during the cropping seasons and the limited awareness of farmers with regard to the importance of using improved seed. The limited awareness might be resulting from the inefficacy of the extension service as only 19.2% of the population reported having been reached by the extension service the same period.

6.2. Current status of government support for improving seed systems

In order to alleviate the problem of access on improved seed and stimulate its use by farmers, the government has revitalized the seed sector by updating seed legislation and developed a national seed subsidy program (PNSSB) and providing support for the implementation of seed production. In 2012, a Law on the organization of the seed sector was signed with the aim to create a framework to enhance the development of the seed sector in order to produce high quality agricultural seeds in sufficient quantity; to promote the participation of private operator in the production and marketing of quality seeds; to create an institutional system for varietal homologation and seed certification system and to develop an international cooperation in the seed trade.

In addition, the National Seed Subsidy Program was developed in 2016 in order to allow the operation of the seed subsidy system. A Common Seed Fund will be set up and funded by the government and its partners supporting the seed sector. The choice of crops benefiting the

subsidy is guided by the orientation of the government policy in terms of development of agricultural sectors in order to develop crops ensuring food security for the majority of the Burundian population. This grant relates to 7 priority crops which are: maize, beans, cassava, potatoes, bananas, rice and fruit trees. The common seed fund will allow the production of seed at an affordable price for smallholder farmers.

6.3. Trends and opportunities for seed systems improvements

The seed system of Burundi is undergoing radical transformation since 2012, when the seed law was enacted. This law allowed the participation of private operator in the production and marketing of quality seeds. Therefore, several farmers' organizations, individual farmers have entered the seed production sector which greatly contributed in improving the seed system.

Today, several opportunities exist in Burundi with regard to seed system improvement. First, the level of supply of improved seed is very low. While the country is eager to improve the productivity of agricultural sector as the backbone of the national economy (40% of GDP), improved seed use is seen as the major tool that can increase the agricultural production in the context of limited land availability. Therefore, players in the seed sector are encouraged and benefit from advantages from both the Government and its partners. Finally, research institutions exist in Burundi with great specialization in the seed production and plant research.

6.4. Recommendations

Improving the seed system of Burundi has many implications on both food security and economic development. Therefore, more collaboration between partners involved in the seed sector is highly encouraged in order to increase the production of seed and its availability at the reach of smallholder farmers at affordable prices. The collaboration would also facilitate the tracking of the seed movement in the country while assuring the seed quality. In addition, it is very required to support the research development among Institutions involved in agricultural production.

More specifically:

- **Provide technical support to public research institutions involved in agricultural research: FACAGRO (FABI) and ISABU:** Since 1993, the public research institutes have had a limited budget to conduct research. Therefore, many equipment have been worn out but not replaced; the personnel need some capacity building,...
- **Provide technical and financial support to the National Seed Quality Control and Certification ONCCS:** Since its creation in 2012, the ONCCS has been experiencing several limitations with regard to shortage in staff, laboratory equipment in order to fulfill the increasing demands of monitoring and certification;
- **Support to agricultural extension services** in order to boost the linkage of research results with extension because research findings are not currently well transmitted to the intended beneficiaries;
- **Support to private seed companies** with subsidies in order to increase the availability of high performing varieties that meet the preference of farmers;

- **Accelerate the implementation the Common Seed Funds** in order to subsidize the production of quality seed at lower prices (affordable for smallholder farmers);
- **Provide support to manufactures** involved in production of equipment for seed processing and packaging in the country;
- **Support to market infrastructure** in order to boost commercialization of agricultural production. To encourage farmers to increase the production of surplus, mechanisms for increased value added (Agro-industry) need to be promoted;
- **Capacity building for the personnel** involved in the seed production chain in Burundi;
- **Capacity building of the farmers 'cooperatives** on seed production and commercialization;
- **Promote the transformation** of traditional extensive into intensive farming system

6.5. Likely impact from the improvement of access to improved seed by smallholder farmers

Improved access to improved seed would have a great impact on country's economy and the farmers' welfare in Burundi. Currently, most farmers are mainly relying on re-used seed which is degenerated with low performance potential to produce enough food to meet households' basic food and income needs. Analysis made on the comparison of yield showed that framers could improve the harvest by at least three times while using certified seed. This would allow farmers to produce surplus to be marketed and generate income. The additional income can help farmers to enjoy the multiple linkages effect of agricultural development (on health, education, etc.).

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