GBioS
Genetics, Biotechnology and Seed Science Unit
Excellence in Seed Science

Republic of Benin
****
Ministry of Higher Education and Scientific Research
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University of Abomey-Calavi
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Faculty of Agronomic Sciences
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Department of Crop Science
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Laboratory of Crop Production, Physiology and Plant Breeding
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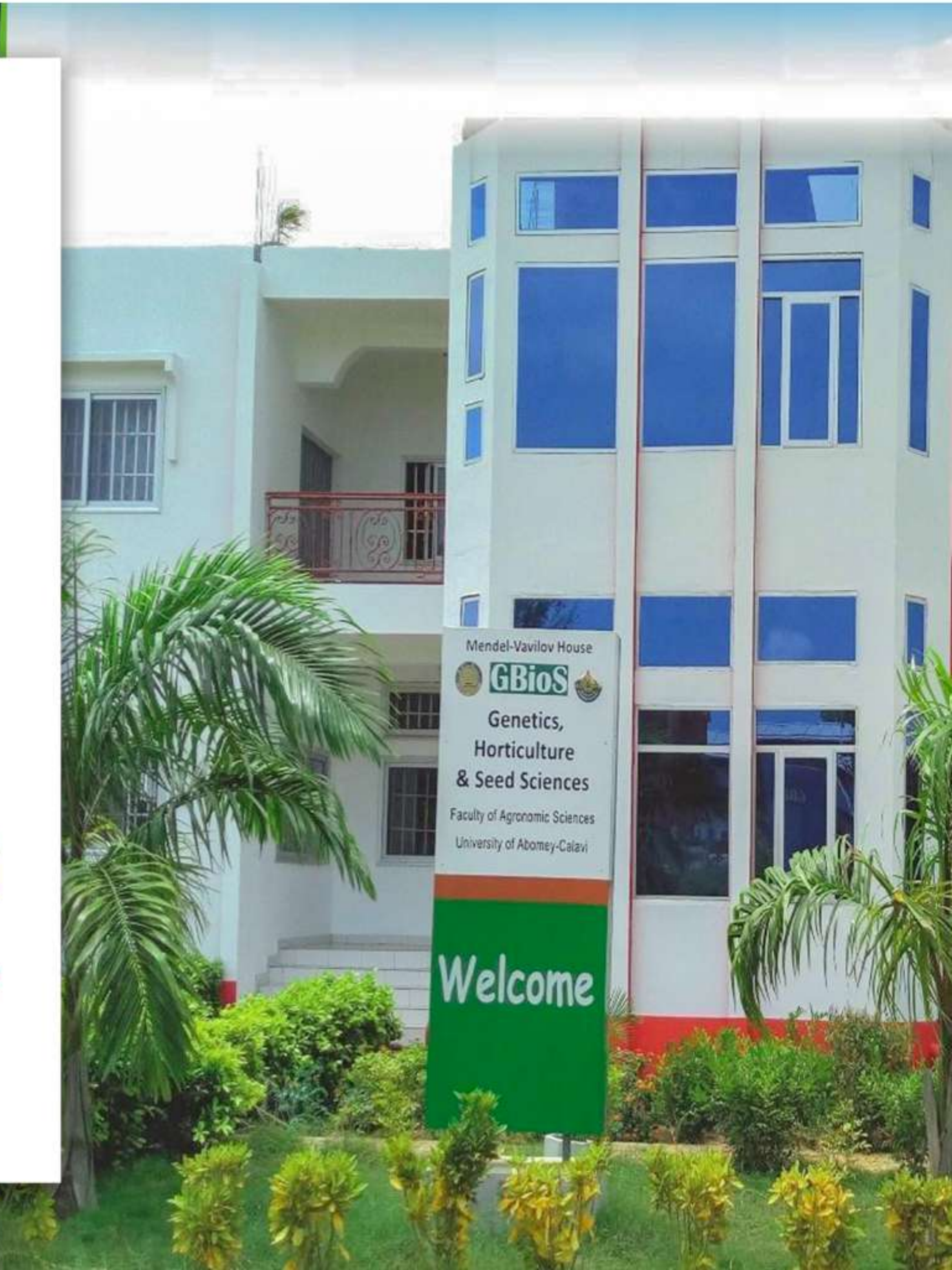
Genetics, Biotechnology and Seed Science Unit

Strategic Plan 2023-2027

September 2023



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List of abbreviations and acronyms

CAMES	Conseil Africain et Malagache pour l'Enseignement Supérieur
DNA	Dioxyribose Nucleic Acid
ESTPV	Ecole des Sciences et Techniques de Production Végétale
FSA	Faculté des Sciences Agronomiques
FUAC	Fondation UAC Start-up Valley
GBioS	Genetics, Biotechnology and Seed Science
RNA	Ribose Nucleic Acid
UAC	Université d'Abomey-Calavi
XOF	West African CFA Franc

Summary

The Genetics, Biotechnology and Seed Science Unit (GBioS) is a research institution of the School of Plant Sciences of the Faculty of Agricultural Sciences (FSA), University of Abomey-Calavi (UAC) in Benin Republic. GBioS has the ambition to breed plant genetic resources for better livelihoods in Africa. GBioS' mission is to provide evidence-based innovations in food and nutrition security to decision makers and end-users. The vision of GBioS is to become by 2027 a centre of excellence in the management and valorisation of plant genetic resources for improved nutrition and sustainable food security for local communities in West Africa with an international reputation for quality, relevance, sustainability, and impact of research results on the target population. The development of this unit requires the elaboration and monitoring of a strategic plan.

Taking into consideration new challenges for GBioS and the operationalisation of its vision, a quinquennial strategic plan (2023-2027) has been elaborated with a focus on seven objectives:

(i) safeguarding plant genetic resources for crop improvement and quality seeds dissemination to end-users;

(ii) generating pre-and post-harvest technologies to reduce losses for improved food security and nutrition;

(iii) improving the productivity of strategic and major crop species through the development of eco-friendly agronomic practices and higher yielding cultivars with improved quality traits;

(iv) improving the productivity of neglected crop species with high economic and nutritional value for local communities through development of improved varieties, formal seed supply systems, design of improved and resilient agronomic practices and development of value chains;

(v) enhancing research and training activities and the valorisation of relevant knowledge and technologies through the creation of viable and innovative companies managed by young entrepreneurs for higher impacts in Africa;

(vi) increase the capacity of the unit for funding activities and extending international collaboration and partnerships; and

(vii) train a highly profiled young generation of scientists and professionals for addressing food and nutrition security issues in African countries.

Key actions planned based on the objectives and expected results from 2023 to 2027 have been evaluated to a total amount of XOF 536,000,000 of which XOF 304,000,000 (56.71%) for research, XOF 228,000,000 (42.53%) for training and XOF 2,000,000 (0.37%) for innovation and job creation and XOF 2,000,000 (0.37%) for fund raising. The existing start-ups are required to raise funding for their activities. The institutional framework for the implementation and evaluation of the strategic plan (2023-2027) includes the piloting and technical committees.

1. Introduction

In all countries, it is well known that the educational system is a key driving force to the economic transformation and development for better livelihoods. In Africa, the situation of the educational sector is alarming in most countries with a huge impact on the employability rate of graduates. Recent reports from national and international institutions pointed out the need to better align curricula content to the needs of the markets with a focus on applied research or development driven research mainly in the domain of climate change and variability, and food and nutritional security. The Genetics, Biotechnology and Seed Science Unit (GBioS) is an ambitious research institution created in 2014 within the School of Plant Sciences at the Faculty of Agricultural Sciences (FSA) of the University of Abomey-Calavi (UAC) with the objectives of tackling challenges in the domain of food and nutrition security and mainly at the nexus crop production-people. In the past years, we have developed technologies/approaches to (i) reduce the yield gap in some important crops, (ii) value neglected crops and unlock their potential for better food and nutrition security, and (iii) reduce the gap between research and development. From 2023 to 2027, our objective is to continue to achieve: "***better science for sustainable livelihood***" for more impact. The present strategic plan (2023-2027) is elaborated to serve as a guide for our interventions in the domain of food and nutrition security. The present document is divided into four sessions:

(i) Presentation of the Genetics, Biotechnology and Seed Science Unit
(ii) Operational foundations;
(iii) SWOT analys;
(iv) Strategic framework and implamentation.

2. Presentation of the Genetics, Biotechnology and Seed Science Unit (GBioS)

Created in 2014, GBioS is a unit of the Laboratory of Crop Production, Physiology and Plant Breeding (PAGEV) of the Faculty of Agricultural Sciences of the University of Abomey-Calavi, Republic of Benin.

2.1. Vision and mission of GBioS

By 2027, GBioS is a centre of excellence in the management and valorisation of plant genetic resources for improved nutrition and sustainable food security for local communities in West Africa with an international reputation for quality, relevance, sustainability, and impact of research results on the target population.
GBioS mission is to provide evidence and innovations in food and nutrition security to decision makers and end-users. To achieve this, GBioS actions portfolio is organised around the following axes:

Axis 1 : safeguarding PGRs for diversification of agricultural systems in West Africa;

Axis 2 : improving crop productivity for food and nutrition security of local communities; and

Axis 3 : promoting quality of agricultural products for incresed economic returns for vulnerable populations.

These axes will be fed by different components, programs, projects, and activities that align with the continuum Research-Training-Entrepreneurship.

2.2. The objectives of GBioS

GBioS aims to generate scientifically sound and economically acceptable and transferable technologies and innovations in the agricultural sector for sustainable livelihoods in Africa. Specifically, GBioS aims at:

1. safeguarding plant genetic resources for crop improvement and quality seeds dissemination to end-users;

2. generating pre- and post-harvest technologies to reduce losses for improved food security and nutrition;

3. improving the productivity of strategic and major crop species through the development of eco-friendly agronomic practices and higher yielding cultivars with improved quality traits;

4. improving the productivity of neglected crop species with high economic and nutritional value for local communities through development of improved varieties, formal seed supply systems, design of improved and resilient agronomic practices and development of value chains;

5. enhancing research and training activities and the valorisation of relevant knowledge and technologies through the creation of viable and innovative companies managed by young entrepreneurs for higher impacts in Africa;

6. increase the capacity of the Unit to mobilise funds through better collaboration and equitable partnerships; and

7. train a highly profiled young generation of scientists and professionals for addressing food and nutrition security issues in African countries.

3. Operational foundations

3.1. Principles and values

The principles and values of the unit are: integrity, punctuality, freedom of mind, quality, equity, excellence, gender sensitivity, and respect to the environment.

3.2. Organisational chart

The GBioS has four major components including: i) the administration, ii) the accountability office, iii) the communication office and iv) the research and development programs, namely Training, Research, Entrepreneurship, Outreach/Partnership and Production. All these components are led by the Director of the Unit (Figure 1).

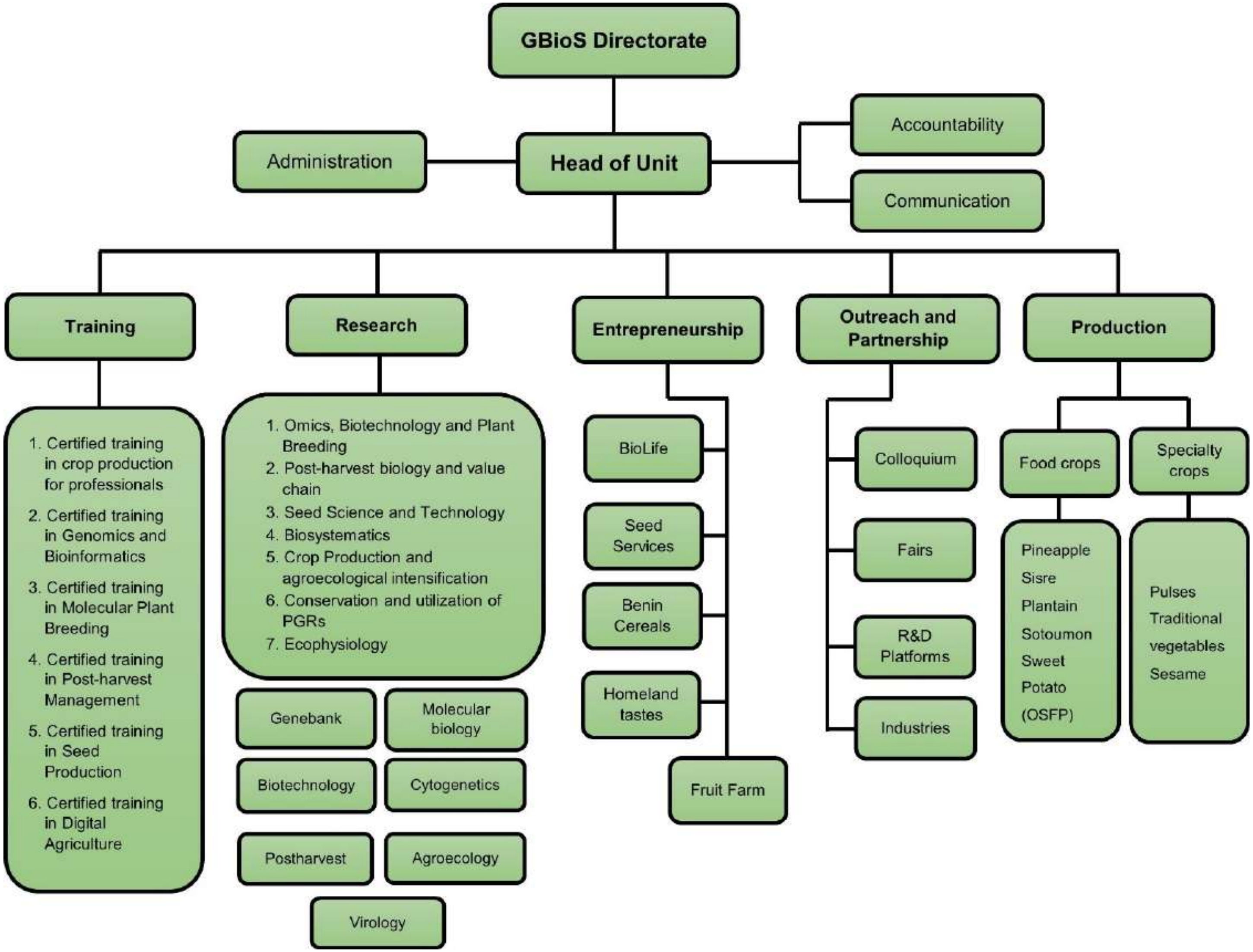

Figure 1. Organigram of the Genetics, Biotechnology and Seed Science Unit (GBioS/FSA/UAC)

3.3. GBioS research and development programs

The GBioS research and development programs ensure the practical implementation of the Unit's activities. Details about each program are presented in Table 1.

Table 1 : Main programs of the research and development component

Programs	*Person in charge*	*Key objectives/activities*
Research	Research Programs Officer	Initiate and plan research activities per year with the various research teams.
		Coordinate the implementation of the various programs
Training	Training Programs Officer	Ensure the follow-up of academic activities (courses and practices)
		Organise capacity building sessions for the benefit of the unit members
		Plan talks, presentations and group reviews, invite participants and arrange the venue
		Plan the writing workshops
		Organise certified training for the community
Innovation and transition	Innovation and transition Officer	Identify, list the different ideas and assist in the translation of ideas into projects
		Organise capacity building sessions for the benefit of startups
		Regularly monitor startups businesses progress and advise accordingly
Outreach and partnership	Outreach and Communication Officer & Administration and partnership Office	Work towards a better visibility of research at GBioS Logistics arrangement for organisation of and participation to international trainings, conferences, workshops, colloquia, and capacity building opportunities
		Organisation of fairs within the unit Website and social media outreach
Production	Production Officer	Ensure the production of different crops on the sites of the unit Ensure the sale of the production

The research programs cover several sections presented in Table 2. These research sections employ various technical platforms to achieve their results. The technical platforms available for this purpose are presented in Table 3.

Table 2 : Sections of GBioS Research programs and associated objectives

Research sections	*Key objectives*
Omics, Biotechnology and Plant Breeding	Define section objectives
	Identify the section's activities related to ongoing research.
	Organise capacity building sessions
	Monitoring and supervision of activities
Biosystematics	Define section objectives
	Identify the section’s activities related to ongoing research
	Organise capacity building sessions
	Monitoring and supervision of activities
Postharvest biology and value chain	Define section objectives
	Identify the section's activities related to ongoing research.
	Organise capacity building sessions
	Monitoring and supervision of activities
Seed Science and technology	Define section objectives
	Identify the section's activities related to ongoing research.
	Organise capacity building sessions
	Monitoring and supervision of activities
Conservation and use of RPGs	Define section objectives
	Identify the section's activities related to ongoing research.
	Organise capacity building sessions
	Monitoring and supervision of activities
Ecophysiology	Define section objectives
	Identify the section's activities related to ongoing research.
	Organise capacity building sessions
	Monitoring and supervision of activities
Plant science and agro-ecological intensification	Define section objectives
	Identify the section's activities related to ongoing research.
	Organise capacity building sessions
	Monitoring and supervision of activities

Table 3 :Technical platforms

Technical platforms	*Key objectives*
Genebank	Collection, documentation, and maintenance of plant genetic resources
	Distribution of genetic resources to interested user-groups
	Publishing of available genetic resources on internationally recognised platforms (e.g., genesys)
Molecular Biology	Molecular genotyping of plants
	Diagnosis and monitoring of diseases
Cytogenetics	Detection of constitutional or acquired chromosomal abnormalities using microscopic techniques
	Establish a biological diagnosis and provide genetic counselling
Tissue culture	Mass-production of economically important and or threatened species
	Plants sanitation
Post-harvest	Reducing the level of weight loss after harvesting fruits and vegetables
	Maintaining fruit and vegetable quality for the end-users
Production, plant science and agro-ecological intensification	Promoting best agroecological practices
	Restores the diversified landscape mosaic
Virology	Plants sanitation; diagnosis and monitoring of viruses

3.4. Resources, achievements, and innovations

Human resources

GBioS has been a strategic Unit in training and research at the Faculty of Agricultural sciences. This has been possible through its quality, qualified and dynamic human resources at various levels, from the field technician to the Unit's leader. Tables 4, 5 and 6 present the GBioS staff by scientific grade, administrative position and learning position, respectively and their expected cumulated number from 2023 to 2027.

Table 4 : Scientific staff by grade

Grade	*2023*	*2024*	*2025*	*2026*	*2027*
Full Professor	02	02	02	03	03
Associate Professor	01	02	02	01	01
Assistant Professor	02	02	01	01	02
Assistant	01	02	03	03	03
Post Doc scientists	04	07	08	08	08
Research Assistants	02	04	04	04	04
Total	12	19	20	20	21

Table 5 : Administrative and technical staff

Qualification	*2023*	*2024*	*2025*	*2026*	*2027*
Secretary	01	01	01	01	01
Communication manager	01	01	01	01	01
Communication assistant	02	02	02	02	02
Account manager	02	02	02	02	02
Assistant accountant	01	01	01	01	01
Public procurement officer	01	01	01	01	01
Technicians	02	03	04	04	04
Field managers	07	07	07	07	07
Total	15	16	17	17	17

Table 6 : BSc, MSc and PhD students supervised at GBioS

Students supervised	*2023*	*2024*	*2025*	*2026*	*2027*
BSc graduates	08	06	06	06	06
MSc students	25	15	10	10	10
PhD students	21	15	12	06	06
Total	41	36	36	26	24

Technical resources

In its research endeavours, the GBioS Unit employed several technical facilities and resources that are outlined as follows:

(i) offices, used as working environment, they are fourteen in total and included 1 for the head, 6 for the postdocs, 2 for PhD students, 1 for the MSc students, 1 for the project managers, 1 for the communication office, 1 for the accountants and 1 for the secretary;

(ii) two conference rooms, that are used for presentations, conference, and meetings;

(iii) visiting scientist room, for hosting national and international scientists;

(iv) genebank, platform used to store and maintain germplasm; this platform has five operational entities:

- the genebank entity: where the ready to use materials are maintained under controlled environment;
- the seed health operational entity (currently known as second genebank space) where seed health status is ascertained before transfer in the central entity;
- the seed conditioning entity (formerly known as operation room), where seeds brought from the field are cleaned, sorted and tested for initial viability.
- the seed drying entity with two rooms, employed in lowering to an acceptable level of moisture content seeds freshly collected from the field; and
- the seed packaging entity, where seeds are conditioned in aluminium foil bag for their future transfer into freezers in the genebank entity;

(v) tissue culture platform, a platform that ensures plants are produced in vitro in the safest possible environments; it has two operational entities:

- two operation rooms, where the in-vitro plant regeneration protocols are optimised; and
- the plantlets storage room, that is the regeneration room where the plants are cultivated prior to their acclimation;

(vi) molecular genotyping platform, where DNA extraction, RNA extraction, Polymerase Chain Reaction and other molecular manipulations are conducted and various plant virus and diseases are detected;

(vii) microscopy platform: used in visualisation of the different parts of a plant: flower, stem, leaf, and the detection of potential chromosomal abnormalities;

(viii) four lectures' rooms with 10-70 seats;

(ix) physiology and biochemistry platform, for the study of plant physiological processes; and

(x) production area: it is a one ha plot on the campus of Abomey-Calavi and extended on six sites outside the campus: 2 ha in Sekou, 1 ha in Zinvié, 10 ha in Sedjè Denou, 5 ha in Massi, 2 ha in Zogbodomey and 3 ha in Dan. In the gardens, several crops and vegetable leaves are produced and some research experiments are also carried out.

Projects

The GBioS Unit is running several projects that are overall aligned with three major thematic areas including i) training and mobility, ii) research and development, and iii) plant genetic resources conservation and utilisation. Research and development projects are dominant in the GBioS program portfolio. Table 7 that gives an in-depth presentation of the GBioS projects also suggests that most of them are ending December 2023 and others are taking up in January 2024. This calls for the necessity to continuously reactivate new projects drafting reflections.

Table 7 : Current research projects at GBioS

N°	*Project title*	*Funding source*	*Project period*	*Project budget (€)*
01	Amplification of agro-ecological transitions for profitable and sustainable cereal and vegetable production systems in the Atacora (Benin) and Houet (Burkina Faso) territories (AGRO-ECO)	Coopération Belge au Développement	2019-2024	499984,25
02	GENES (Mobility for plant genomics scholars to accelerate climate-smart adaptation options and food security in Africa)	European Union	2018-2023	1,399,800
03	BIOVALOR (Renforcement de la démarche compétence et de la culture entrepreneuriale dans la formation supérieure agronomique : leviers pour l'insertion professionnelle et le développement de la bioéconomie au Bénin)	PEA-ANR Agence Française de Développement	2021-2026	3380808
04	BMZ-Choose, Grow and Thrive	German Ministry of Economic Cooperation	2021-2023	137,160
05	TAERA (Accompagnement de la transition Agro-Écologique par la Recherche Agricole)	ENABEL (European Union)	2021-2024	199,952.17
06	SAFE-PGR (safeguarding Plant Genetic Resources of Benin for a sustainable future use)	CROP TRUST	2022-2023	77,851.73
07	TAVI (Taiwan Africa vegetable initiative)	Taiwan council of Agriculture and Ministry of Foreign Affairs	2021-2023	228,600
08	Analysis of sociocultural and /or economic motivators or barriers to cowpea utilisation at various stages and scales within production and market system inWest Africa (Phase 2)	United State Agency for international development (USAID)	2022-2023	65,927.86
09	FRESH (Fruits and Vegetables for sustainable healthy diets)	World Vegetable Center	2022-2032	+ 31,938
10	Seed kits (Vegetable seed kits for food security in Madagascar and Benin)	German Ministry of Economic Cooperation	2023	18,095
11	PATH (Capacity Building of African Young Scientists in Precision Agriculture Through Cross-Regional Academic Mobility for Enhanced Climate-Smart Agri-Food System)	European Union	2024-2027	1796820.00
12	ORPHAN (Mobility for high skilled scientists and entrepreneurs on orphan crops in higher education for accelerated climate change solutions in Africa)	European Union	2024-2027	1,796,820
13	GENES II (Mobility for Plant Genomics Scholars to Accelerate Climate-Smart Adaptation Options and Food Security in Africa II)	European Union	2024-2027	1796820

Achievements and innovation

The Unit has five major research and development programs including Research, Training, Production, Outreach and Entrepreneurship that are all functional. With its academic vocational institution status, formal training and research are part of its intrinsic activities whereas Production and Entrepreneurship were designed as supportive and strategic components. It is one of the rare Unit where research, training, production and entrepreneurship are tied up.

Research activities at GBioS are facilitated by seven sections, including Omics, Biotechnology and Plant Breeding, Biosystematics, Postharvest biology and value chain, Seed Science and technology, Conservation and use of RPGs, Ecophysiology, Plant science and agro-ecological intensification, which focus on promising orphan crops such as *Synsepalum dulcificum, Gynandropsis gynandra, Vitex doniana, Digitaria exilis, Amaranthus spp, and Macrotyloma spp and strategic crops such as Zea mays, Oryza sativa, Lycopersicum esculentum, Ananas comosus, Musa sapientum*. etc, but also vegetables.

Regarding the academic training, the Unit ensures that first year and second year students of the FSA get hand-on skills in crop production, harvesting and good postharvest management. Through practical activities, students get acquainted with a number of agronomic practices such as mulching, intercropping, use of legumes to improve crop yield and the use of agricultural equipment. Genebank's management, trial establishment, molecular biology technics and data collection are taught to MSc students.

As far as production is concerned, GBioS' farm is specialised

in horticultural crops production of exotic as well as traditional vegetables such as: *Gynandropsis gynandra* (spider plant), Amaranthus spp, *Ocimum gratissimum* (tchiayo), *Cymbopogon citratus* (lemon grass), *Hibiscus sabdariffa* (roselle), *Ananas comosus* (pineapple) which is managed by a team composed of 4 technicians.

The entrepreneurship component at GBioS promotes the creation and establishment of start-ups. The lab currently has five functional start-ups all run by graduates:

- **HomeLand tastes**, created in 2016 and specialised in the production of herbal tea based on medicinal plants such as moringa, ginger, roselle etc.;

- **Seed Services**, created in 2016 and specialised in the production and distribution of high quality of horticultural seeds and seedlings;

- **Biolife**, created in 2017 and specialised in the production and commercialization of bio-fertilizers and bio-pesticides for sustainable and environmentally friendly intensification of vegetables production in Benin;

- **Cereals Benin** also created in 2017 and specialised in the promotion of neglected or/and underutilised cereals like fonio and its derived products; and

- **Fruit farm**, a start-up which is specialised in the promotion of indigenous fruits as: miraculous berry, watermelon, by producing them for the population.

These start-ups are expected to provide employment and internship workplace to newly graduate students to overcome the increasing rate of unemployment.

Key success factors

GBioS is endowed with a team of achievers. One of the major resources of the Unit is the commitment of a research and development team capable of positive changes. A key element of success lies in the fact that the management and orientation of the unit is achieved in a constructive way. Moreover, there is a working space developed by the research team to support the strategic actions in place. That working space is a strong trigger of positive transformation which has been put in place steadily. The conducive institutional supported by the faculty and the rectorate contribute a lot to the overall achievements of GBioS. Thanks to its alumni and current BSc, MSc and PhD students, the Unit was able to attract a lot of visitors from across the world. Many students from GBioS got scholarships with most of them studying in English-speaking countries such as Ghana, Netherlands, Germany, United States of America, UK and South Africa. Currently, GBioS team is involved in many agricultural projects with high and positive impact on smallholder's farmers including youth and women with a total amount of about Euros 3,500,000. From 2015 onwards, GBioS has received more than one hundred (100) international visitors from different countries in the world. All of them were impressed by the financing model and the commitment of the team.

4. SWOT analysis

The analysis of GBioS's strengths, weaknesses, opportunities and threats is outlined in the table below.

Table 8 : SWOT analysis of GBioS

Strengths	*Weaknesses*
Strong ties with international institutions such as WorldVeg, ICRISAT, and AFRICA RICE through GBioS fellows occupying positions in these institutions / Existence of partnerships at the national, continental, and international levels / A good capacity in the search for collaboration on the national and international level / Has many partners at national, regional and international levels.	The inexistence of a mechanism to swiftly value rejected manuscripts Discontinuation of the traditional scientific writing sessions which made it possible to increase scientific publications.
Strong capacity in financial resources mobilisation / Good fundraising strategy (through research and development projects, innovations, etc.) Qualified human resources / - Experience in the field of research - Dynamic and proactive team / Availability of qualified personnel / Dynamism at work/ Qualified scientific and administrative personnel	Unavailability of an internal mechanism for assisting students regarding their scientific challenges; Unavailability of a suggestion mailbox Slow administrative process for the disbursement of funds for the implementation of activities.
Good management and good leadership / good management of the Unit's sections / Discipline in the management of the unit's farm which continues to be a showcase at the University and the Faculty of Agricultural Sciences (FSA)	Unavailability of a trained laboratory technician (the handling of chemicals requires adequate training).
Conducive working environment (office, experimental plot) / Availability of an adequate working environment (laboratory equipment, offices, rolling stock) / Existence of offices for staff / Purchase and exploitation of agricultural domains that serve as training and experimentation sites Increased online community that engages with the output disseminated	Lack of machines on the different sites to facilitate the work Issue to access water on some experimental sites such as Zogbodomey.
Opportunities	*Threats*
Existence of several institutions supporting research on horticultural crops (fruits and vegetables) Government's interest in some crops of interest and the existence of government development agencies focusing on some GBioS' priority crops Increased interest from other laboratories and researchers to build partnerships with GBioS Availability of project funding and opportunities to win funding Existence of high demand for training and services offered by GBioS	Several laboratories in Benin work on Genetics and Improvement of orphan species / Creation of competing laboratories / Existence of institutions/laboratories operating in the same field (WorldVeg, INRAB, Laboratories of UAC or other universities offering training, and conducting research activities) Lack of workforce on the experimental sites of the Unit / Dependence on hired workers (labour) for some activities on the production sites Unavailability of skills for the maintenance and repair of equipment /Lack of quality service for the timely maintenance of laboratory equipment and materials

5. Strategic framework and implementation

5.1. Objectives and key performances indicators

Table 9 below presents the objectives and key performance indicators that will guide the implementation of the actions listed in the strategic plan.

Table 9 : Objectives and key performance indicators

Objectives	*Expected results*	*Key performance indicators*
O1. Safeguarding plant genetic resources for crop improvement and quality seeds dissemination to end-users.	**R1.1**. Plant genetic resources including neglected plant species are collected and safeguarded in GBioS genebank and duplicates shared with international genebanks. **R1.2**. Cohort of students are trained on how to collect and safeguard plant genetic resources. **R1.3**. Seeds of plant genetic resources are produced and made available to users (local communities, agencies, students, researchers, seed companies, policy makers).	**I.1.1**. 30% increase in the number of genetic resources available at GBioS genebank by 2027. **I.1.2**. At least 4,000 accessions from GBioS genebank are duplicated in other genebanks by 2027. **I.1.3**. 25 MSc and 3 PhDs are trained in seed science and technology and plant genetic resources and utilisation by 2027. **I.1.4**. At least 50 requests for a total of 10 kg of seeds are satisfied by 2027. **I.1.5**. One reference document aligned with international standard is implemented in GBioS genebank by 2027.
O2. Generating pre- and post-harvest technologies to reduce losses for improved food security and nutrition.	**R2.1**. Pre-harvest technologies for losses reduction are developed and disseminated among end-users. **R2.2**. Post-harvest technologies for losses reduction are developed and disseminated among end-users.	**I.2.1**. At least 2 PhD students and 10 MSc students are trained on pre- and post-harvest technologies development for losses reduction by 2027. **I.2.2**. At least 10 scientific publications on pre-harvest technologies for losses reduction are published in high impact factor journal by end 2027. I.**2.3**. At least 10 scientific publications on post-harvest technologies for losses reduction are published in high impact factor journal by 2027. **I.2.4**. At least 5 technical sheets are produced and made available to end users by 2027. **I.2.5**. Generated knowledge on pre- and post-harvest technologies for post-harvest losses reduction are shared during 4 international conferences via poster/oral presentation by 2027.

Objectives	*Expected results*	*Key performance indicators*
O3. Improving the productivity of strategic and major crop species through the development of eco-friendly agronomic practices and higher yielding cultivars with improved quality traits.	**R3.1**. Productivity of strategic and major crop species (e.g., pineapple, maize, rice, tomato, cashew, sesame, soybean) is improved.	**I.3.1** At least one higher-yielding line of strategic and major cop species with acceptable quality attributes is released by 2027. **I.3.2** At least 10 PhD are trained on breeding and eco-friendly agronomic practices for improved crop yield by 2027. **I.3.3** At least 20 scientific publications on breeding and eco-friendly agronomic practices for improved crop yield are published in high impact journal by 2027. **I.3.4** At least 10 technical sheets on technologies for crop yield improvement are developed and shared widely among end-users by 2027. **I.3.5** At least 10 MSc are trained on breeding and eco-friendly agronomic practices for improved crop yield by 2027.
O4. Improving the productivity of neglected crop species with high economic and nutritional value for local communities through development of improved varieties, formal seed supply systems, design of improved and resilient agronomic practices and development of value chains.	**R4.1**. Productivity of neglected crops with high economic and nutritional value (e.g., spider plant, Sisrè berry plant, kersting's groundnut, fonio, shea tree, Egusi, orange-fleshed sweet potato) is improved.	I.4.1. At least one higher-yielding line of neglected crops with acceptable quality attributes is released by 2027. **I.4.2**. Seed system of at least two neglected crops are functional by 2027. I.4.3. Agronomic practices are generated/updated for at least four neglected crops by 2027. **I.4.4**. At least 20 scientific publications on neglected crops are published in high impact journals by 2027. **I.4.5**. At least 10 technical sheets on neglected crops by 2027.
O5. Enhancing research and training activities and the valorisation of relevant knowledge and technologies through the creation of viable and innovative companies managed by young entrepreneurs for higher impacts in Africa.	**R5.1**. GBioS-generated knowledge is translated into commercial products by the Unit's start-ups.	**I.5.1**. A platform of start-ups is created and functional by 2027. **I.5.2**. All start-ups are upgraded and formally registered.

Objectives	*Expected results*	*Key performance indicators*
O6. Increase the capacity of the lab for funding activities and extending international collaboration and partnerships	**R6.1**. A mechanism to secure funds through projects, start-ups and training is in place. **R6.2**. Existing partnership with partners at national, regional and international levels are strengthened. **R6.3**. New partnerships are initiated with MoUs signed.	**I.6.1.** On average, t one project (USD 100-500 thousand) secured every year by 2027. **I.6.2**. Existing partnerships strengthened through at least two regular meetings per year. I.6.3. At least two new functional partnerships (e.g., WACCI, UM6P) established by 2027.
O7. Train a highly profiled young generation of scientists and professionals for addressing food and nutritional security issues in African countries.	R7.1. Highly profiled young generation of scientists and professionals are trained.	**I.7.1**. At least 5,000 young scientists and professionals are provided with knowledge to address food and nutrition security through webinars, seminars and training workshops by 2027. **I.6.2.** At least four regional conferences are organised to disseminate knowledge on food and nutrition security among young scientists and professionals by 2027.

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5.2. Projection of anticipated results from 2023 to 2027

GBioS expected results from the strategic plan implementation are presented in Table 10 below.

Table 10 : Projection of anticipated results

		Period				
Objectives	*Expected results*	*2023*	*2024*	*2025*	*2026*	*2027*
O1. Safeguarding plant genetic resources for crop improvement and quality seeds dissemination to end-users	**R1.1**. Plant genetic resources including neglected plant species are collected and safeguarded in GBioS genebank and duplicates shared with international genebanks.	x	x	x	x	x
	R1.2. Cohort of students are trained on how to collect and safeguard plant genetic resources.	x	x	x	x	x
	R1.3. Seeds of plant genetic resources are produced and made available to users (local communities, agencies, students, researchers, seed companies, policy makers).	x	x	x	x	x
O2: Generating pre- and post-harvest technologies to reduce losses for improved food security and nutrition.	**R2.1.** Pre-harvest technologies for losses reduction are developed and disseminated among end-users.	x	x	x	x	x
	R2.2. Post-harvest technologies for losses reduction are developed and disseminated among end-users.	x	x	x	x	x
O3: Improving the productivity of strategic and major crop species through the development of eco-friendly agronomic practices and higher yielding cultivars with improved quality traits.	**R3.1**. Productivity of strategic and major crop species (e.g., pineapple, maize, rice, tomato, cashew, sesame, soybean) is improved.	x	x	x	x	x

Objectives	*Expected results*	Period				
O4: Improving the productivity of neglected crop species with high economic and nutritional value for local communities through development of improved varieties, formal seed supply systems, design of improved and resilient agronomic practices and development of value chains.	**R4.1**. Productivity of neglected crops with high economic and nutritional value (e.g., spider plant, Sisrè berry plant, kersting's groundnut, fonio, shea tree, Egusi, orange-fleshed sweet potato) is improved.	x	x	x	x	x
		x	x	x	x	x
		x	x	x	x	x
		x	x	x	x	x
		x	x	x	x	x
		x	x	x	x	x
O5: Enhancing research and training activities and the valorisation of relevant knowledge and technologies through the creation of viable and innovative companies managed by young entrepreneurs for higher impacts in Africa.	**R5.1**. GBioS-generated knowledge is translated into commercial products by the Unit's start-ups.	x	x	x	x	x
O6. Increase the capacity of the lab for funding activities and extending international collaboration and partnerships.	**R6.1**. A mechanism to secure funds through projects, start-ups and training is in place.	x	x	x	x	x
	R6.2. Existing partnership with partners at national, regional, and international levels are strengthened.	x	x	x	x	x
	R6.3. New partnerships are initiated with MoUs signed.	x	x	x	x	x
O7.Train a highly profiled young generation of scientists and professionals for addressing food and nutritional security issues in African countries.	**R7.1**. Highly profiled young generation of scientists and professionals are trained.	x	x	x	x	x

5.3. Institutional framework for implementation

The institutional framework of the strategic plan is composed of two committees namely the Directorate and the management team.

Directorate

The mission of this committee is to give concrete orientations for an efficient implementation of the strategic plan and coordinate the achievement of the expected results and then the implementation of required actions. This Directorate is composed of:
- the Director of the Unit
- the Research Programs Officer
- the Training Programs Officers
- the Innovation and transition Officer
- the Outreach and Communication Officer
- the Administration and partnership Officer
- the Production Officer

Management committee

The management team has the mission of reviewing monthly the progress made in the implementation of key activities indicated in the annual planning of actions. This team is structured as follows:
- Directorate;
- the project managers;
- the accountants and the public procurement officer;

The management committee must meet every first Monday of the month.
The effective implementation of the strategic plan requires a proper activity of these two committees.

5.4. Follow-up and evaluation mechanism

The assessment of the strategic plan by the technical committee includes the following:

(i) follow up on the implementation of planned actions and key performance indicators; and

(ii) mid-term and final assessment of the strategic plan.

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