Labef

Laboratoire de Biomathématiques
et d'Estimations Forestières

ANNUAL REPORT | 2017

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Acknowledgements

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The Laboratoire de Biomathématiques & d'Estimations Forestières would like to acknowledge with thanks, the technical and financial supports of its partners along the academic year 2016-2017. The accomplishments highlighted in this report would not be possible without your support.

List of abbreviations, sigles & acronymes

AEC-MSA	:	African Excellence Center in Mathematical Sciences and Applications
AGNES	:	African German Network of Excellence in Science
BSc	:	Bachelor
CAMES	:	Conseil africain et malgache pour l'enseignement supérieur
DEA	:	Diplôme d'Etudes Approfondies
IF	:	Impact Factor
IFS	:	International Foundation for Science
IRD	:	Institut de recherche pour le développement
LABEF	:	Laboratoire de Biomathématiques et d'Estimations Forestières
MSc	:	Master
PhD	:	Philosophiæ doctor
RUFORUM	:	Regional Universities Forum for Capacity Building in Agriculture
TWAS - ROSSA	:	The World Academy of Sciences - Regional Office for Sub-Saharan Africa

Contents

LABEF director statement

Dear friends,

I am pleased to present you with the Laboratoire de Biomathématiques et d'Estimations Forestière's annual report for 2017. The year was one of impressive with outstanding accomplishments and steady growth across all areas, including research activities and collaboration, trainings, scientific seminars and conferences, and significant contribution to science in areas ranging from biostatistics, forestry and agroforestry, ethnobotany, ecology and conservation.

All of this growth is framed and aimed at enhance understanding of biological systems through effective use of biomathematical tools for sustainable forestry and development.

At LABEF, we are empowering biomathematics and Forestry sciences through our fundamental and applied research projects, our collaboration with local, national and international research institutions and practitioners, and through scientific education programs and capacities development (seminars, conferences, trainings, schools) that reach in 2017 an ever-expanding audience, and by providing the national and regional research communities with capacities and support that make easier the use of mathematical tools in life science.

In 2017, we collaborated with numerous research and funding institutions. They all have been of great importance for our achievements, supporting our ideas and providing our scientists and collaborators with funds and technical guidance to explore new domains in mathematical and forest sciences.

Although LABEF has significant contribution to science in 2017, we think that success in scientific research is measured not in grant dollars or publications but in the impact on real human lives. Our monthly seminar and conferences, periodic trainings, our internship programme and our regional Biostatistics Master (MBIOST) exemplify this commitment to support the research communities at national and regional levels for impact in human life.

All of us at LABEF are committed to empowering biomathematics and forest sciences through our work. With your support, we will continue to lead research that will impact forest resources and development.

Prof Romain Glèlè Kakaï,
Director of LABEF

OVERVIEW *of* LABEF

1. Introduction to LABEF

In spite of being a fundamental tool in understanding, modelling and prediction, mathematics in general and biostatistics in particular has received little attention in biological sciences and particularly forestry in Africa. To address this issue, the Laboratory of Biomathematics and Forest Estimations LABEF was created on May 27th, 2014 by Prof Romain Glèlè Kakaï, Professor of Biometry and Forest estimations

LABEF is part of the school of Environment Planning and Management, Faculty of Agronomic Sciences, University of Abomey-Calavi. The Laboratory works on the development and popularization of innovative statistical methods and innovative solutions for forest restoration and management, for the optimal delivery of their multiple contribution to people's quality of life.

Mission

- *Our mission is to enhance understanding of biological systems through effective use of biomathematical tools for sustainable forestry and development.*

Vision

- *The vision of the Laboratory is to be a leading institution in developing mathematical tools for biologists and supporting decision makers in Forestry for better life. In addition, LABEF has a good background in scientific writing and statistical analysis and is frequently solicited by other national and international institutions for capacity building in statistical analysis.*

Objective

- *The Laboratory of Biomathematics and Forest Estimations aims at analyzing the applicability of mathematics tools in life sciences and at understanding the interactions between ecological processes, anthropogenic factors and structure of terrestrial ecosystems, with a clear link to management and policy.*

LABEF is organized in 4 departments including fundraising department, social life department, administrative department, and research department. The research department includes four interrelated units namely: Unit of Biomathematics and Applied statistics; Unit of Forest Methods; Unit of Forest Ecology and Management and the Unit of Forest and People.

- **The research unit on biomathematics and applied statistics** falls into biology and mathematics and are interested in applications of mathematics in the field of biology. This unit

is interested not only in the use of mathematical theories in biology but especially publishing scientific notes describing the application of different mathematical tools in life sciences.

- **The Forest Methods unit** falls thus into the overall perspective (assess the wood resources, biomass, mineralomass and carbon stock available in forest ecosystems). Hence, it provides essential information for policy planning and forest resources management of the development of accurate and robust methods for estimating forest resources.
- The goal of **Forest Ecology and Management** is to understand these ecological processes and patterns (forest ecosystems and forest ecosystem services, patterns and processes that govern the ecology of species and the system of which these species are parts, seed ecology and systems) and to develop accordingly clear and applicable management policies for forest managers and decision makers.
- The **Forest & People research unit** is in line with this issue and undertakes investigations on forest governance approaches, their effectiveness and replicability, their socio-economic and ecological outcomes, decision making process, benefit sharing etc.

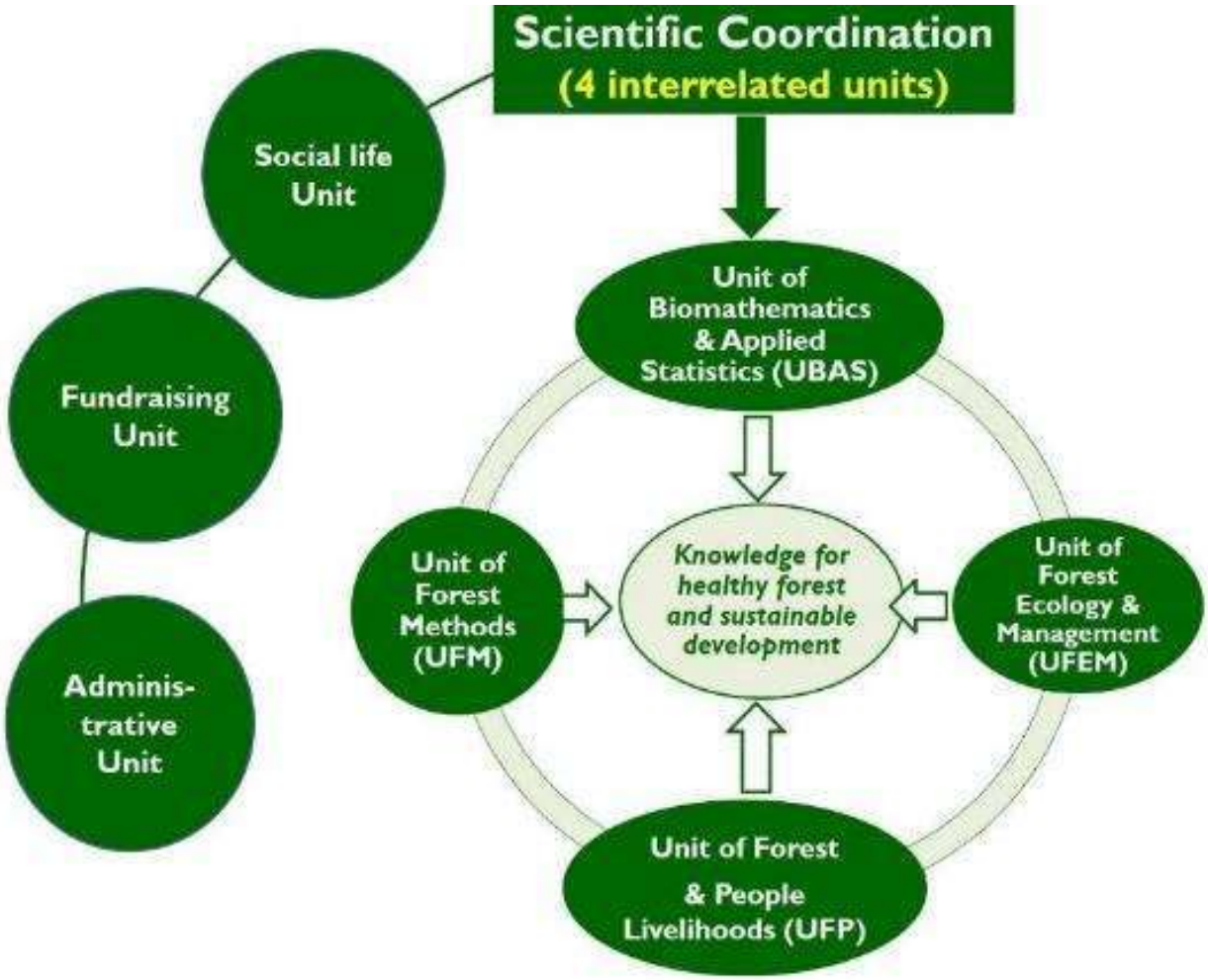


Figure 1: Descriptive chart of the organization of the Laboratory

2. Scientists and collaborators of LABEF in 2017

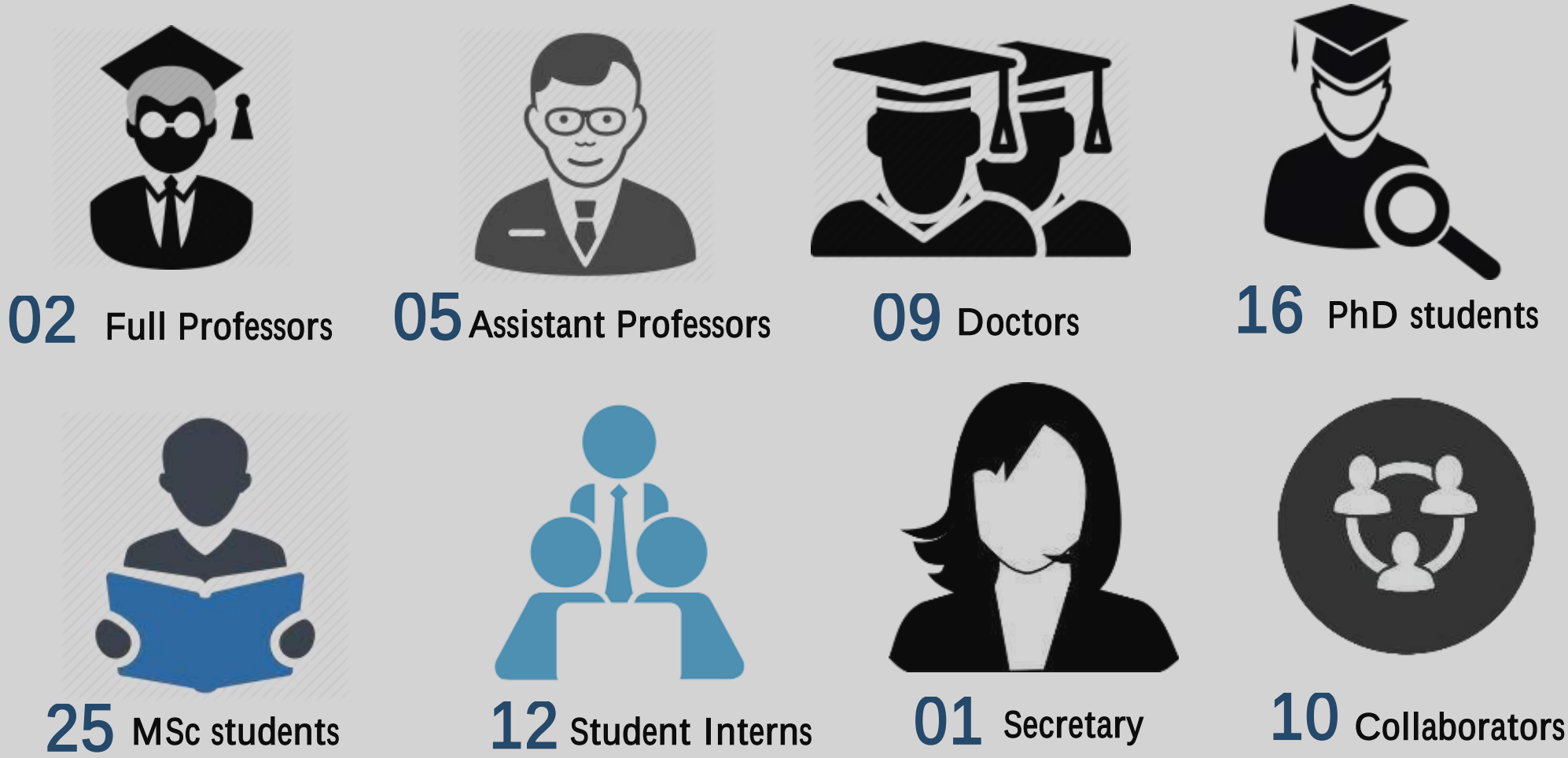
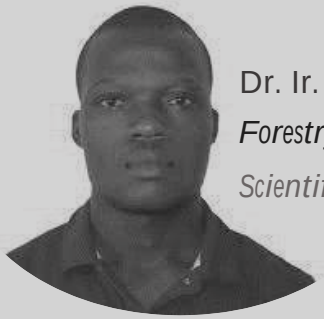


Figure 2 : Synthetic chart showing Human resources of LABEF in 2017.

3. Management team of LABEF in 2017

Prof. Dr. Ir. Romain Glèlè Kakaï
Biometry and Forestry
Director of LABEF

Afia Ombada, BSc
Administrative Department



Dr. Ir. Valère Kolawole Salako
Forestry, Ecology and Biostatistics
Scientific coordinator

Dr. Marcel Donou
Forestry and Ethnobiology
Social Life department

Dr. Ir. Charlemagne Gbemavo
Forestry modelling and Ecology
Biomathematics and Applied Statistics Research Unit

Dr. Ir. Rodrigue Idohou
Ecology and Spatial modelling
Forest methods Research Unit

Dr. Jean Didier Akpona
Forest management
Forest Ecology and Management Research Unit

Dr. Ir. Rodrigue Castro Gbedomon
Social forestry and Value Chains Development
Forest and People Livelihood Research Unit

CONTRIBUTION

to Science & Development

1. Research projects and collaboration

Research activities in LABEF were supported by both national and international institutions. In 2017 LABEF extended its partnership, led or co-led different research projects. Its portfolio of project included small, medium and large research project.

Small projects involved individual researchers of the Lab for up to $10 000. In 2017, the Lab housed 20 small projects from which 13 were new grants, representing an extension of about 216%. The new research grants dealt with different research issues and were funded by different institutions:

- 04 research grants from the International Foundation for Sciences (IFS)
- 02 research grants from the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM)
- 02 research grants from Rufford
- 01 research grant from the African Excellence Center in Mathematical Sciences and Applications (AEC-MSA)
- 01 research grant from the France Embassy
- 01 research grant from the International Tropical Timber Organization
- 01 research grant from Consolidoc
- 01 research grant from Sud Expert Plants (SEP2D)

For the medium and large research projects, LABEF partnered with others national and international involved different institutions. In 2017, LABEF hosted 11 medium and large projects from which 5 were new projects. The new projects include;

- A medium project funded by FNRSIT
- A medium project funded by IRD
- A large project funded by RUFORUM
- A large project funded by a consortium of institutions (the Agropolis Fondation – Fondazione Cariplo and Fondation Daniel et Nina Carasso)
- A large project funded by the French Global Environmental Facility

These new projects witness not only the reputation of LABEF and the confidence of funding institutions and others institutions toward our institution, but also the capacity of the LABEF to develop its portfolio of projects.

Overall in 2017, LABEF was involved in collaborative research project with a dozen of institutions from 5 countries (Burkina Faso, Mali, Togo, Denmark, Belgium, France). About 16 funding organizations trusted our Lab and supported our actions.

Details about small research projects are available upon request to grantee (See Appendices 1.12 and 1.13). Details about medium and large research projects are available on our website http://labef-uac.org/en/ongoing-projects/

2. PhD thesis in 2017

During the academic year 2017, 14 PhD research projects were under supervision or co-supervision in LABEF at different stage of research (Figure 1). More than half of the research projects was at their inception. About 14% of projects were at second year of implementation. Three projects were successfully defended while a last one was nearly completed and waiting for defense procedure. Research projects were dominated by biometry issues (nearly half of the research projects) while 35.7% of PhD research topics deals with forestry and related sciences. Other research interest included Ethnobotany and related sciences, Agronomy and environmental chemistry.

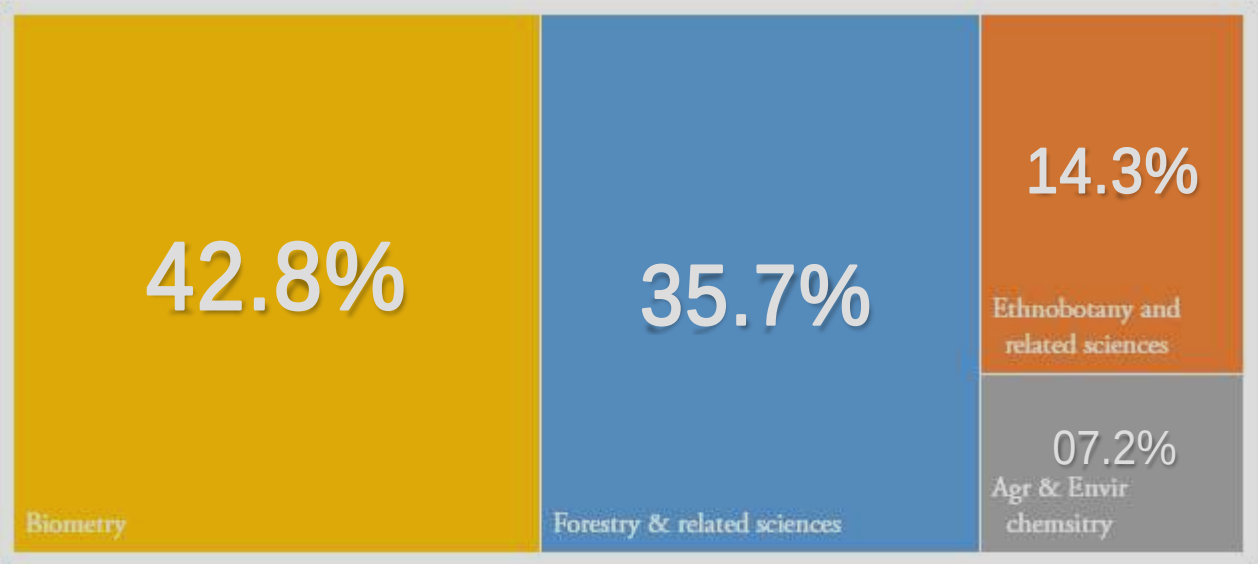


Figure 1: Different stage of PhD research projects (Right) and field of investigations (Left)

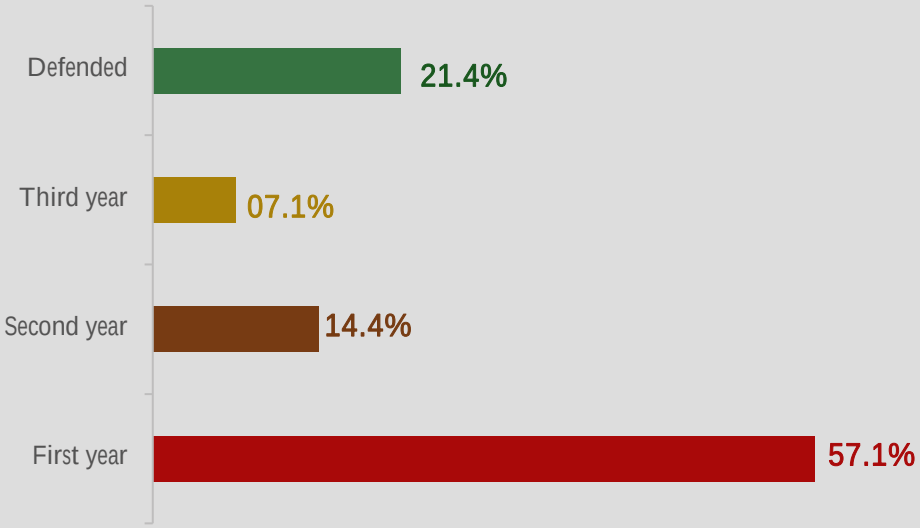


Figure 1: Different stage of PhD research projects (Right) and field of investigations (Left)

3. Master thesis in 2017

In 2017, twenty master research projects were completed in LABEF spanning different research topics (Figure 2; Appendix 1.3).

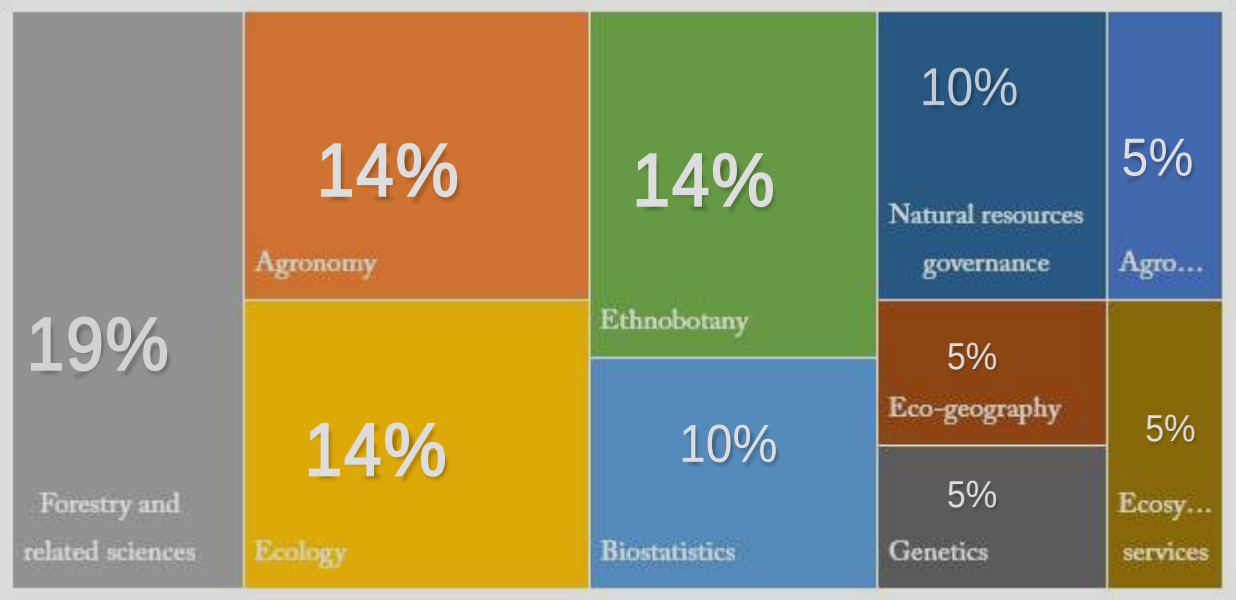


Figure 2. Fields of research for Master theses

4. Scientific publications in 2017

4.1. Publications milestones

In 2017, LABEF and its members worked on and collaborated in 66 knowledge products (Figure 3) including 59 manuscripts from which about more than half (57.62%) was published and 07 technical reports.

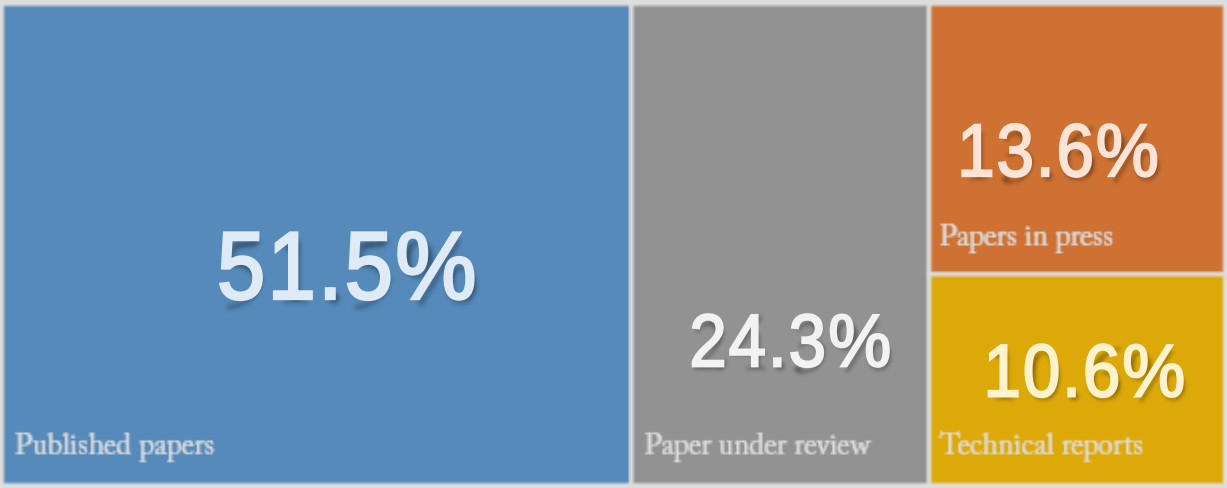


Figure 3 Publications in LABEF in 2017

In comparison to 2016, the production of knowledge products decreased quantitatively in 2017 for about 09.6 %. However, the number of published article increased (Figure x) by 9.67 % and reached 34 publications in 2017, representing a ratio of about more 3 articles per academic month. While LABEF members do not contribute to book editing in 2017, they have been active in technical reports production which (Figure 4).

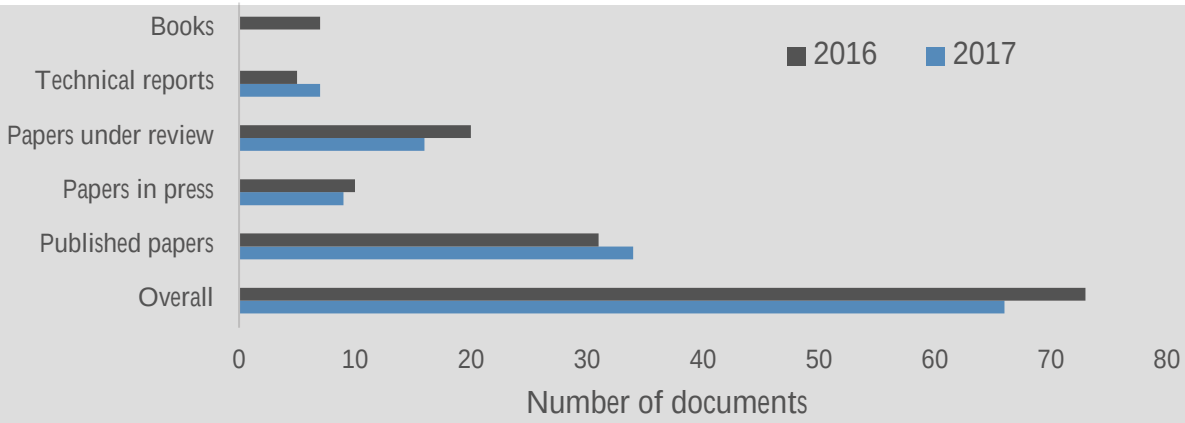


Figure 4: Publications in LABEF in 2016 and 2017

4.2. Diversity of journals

In 2017, knowledge products from LABEF were published, nearly published or in process for publication in 42 journals (Table 1). The Top five journals are Agroforestry systems, Annales des Sciences Agronomiques, Bois et Forêts des tropiques, Environment, Development and Sustainability, Journal of Ethnobiology and Ethnomedicine.

Table 1. Journals considered for publication in 2017

Journal	Nb	Journal	Nb
Agroforestry Systems	5	Forests, People and the Environment	1
Annales des sciences agronomiques	5	Fruits	1
Bois et forêts des tropiques	4	Genetic Resources and Crop Evolution	1
Environment, Development and Sustainability	3	International Journal of Applied Mathematics and Statistics	1
Journal of Ethnobiology and Ethnomedicine	3	International Journal of Mathematics and Statistics	1
Southern Forest	2	International Journal of Microbiology	1
Tropical Ecology	2	International Journal of Tropical and Subtropical Horticulture	1
African Crop Science Journal.	1	Journal of Agricultural Science and Technology	1
African Journal of Rural Development	1	Journal of Applied Biosciences	1
Agriculture Research Journal	1	Journal of Entomology	1
Agronomie Africaine	1	Journal of Environmental Management	1
Applied statistics	1	Journal of Forestry Faculty	1
Biodiversity and Conservation	1	Journal of Insects as Food and Feed	1
Biomass and Bioenergy	1	Larhyss journal	1
Biotechnologie Agronomie Société Environnement	1	Livestock Research for Rural Development	1
Economic Botany	1	Oecologia	1
Ecosystem Services	1	Science of Food and Agriculture	1
e-Journal of Science & Technology	1	Seed Science and Technology	1
Ethnobiology and Conservation	1	South African Journal of Botany	1
European Scientific Journal	1	Tropical Conservation Science	1
Forest Ecology and Management	1	Turkiye Klinikleri J Biostat	1

4.3. Diversity of issues

The research in LABEF in 2017 dealt with a diversity of issues covering different disciplines (Figure 5). Forestry and related sciences, Conservation, Ethnobotany, Statistics and related sciences and Agroforestry were the most investigated fields (Figure 5).

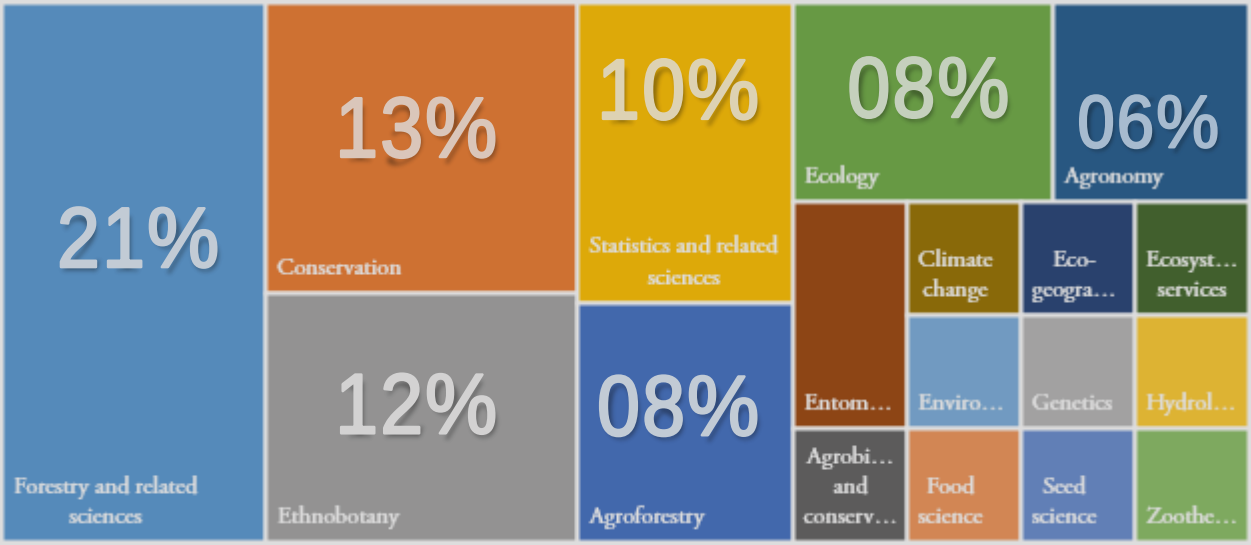


Figure 5. Issues debated in publications of LABEF in 2017

4.4. Collaboration in publication

LABEF works with a wide range of both local and international partners for research (Figure 6). At country level, most of the publications were written with researchers from different institutions in Benin (71 %). However, some high and fruitful collaboration existed with scientists from others countries (Figure 5). At the continent level, most of the publications were produced in collaboration with researchers from Africa (90%; Figure 6). Others collaborators are from Europe, Asia, and America.

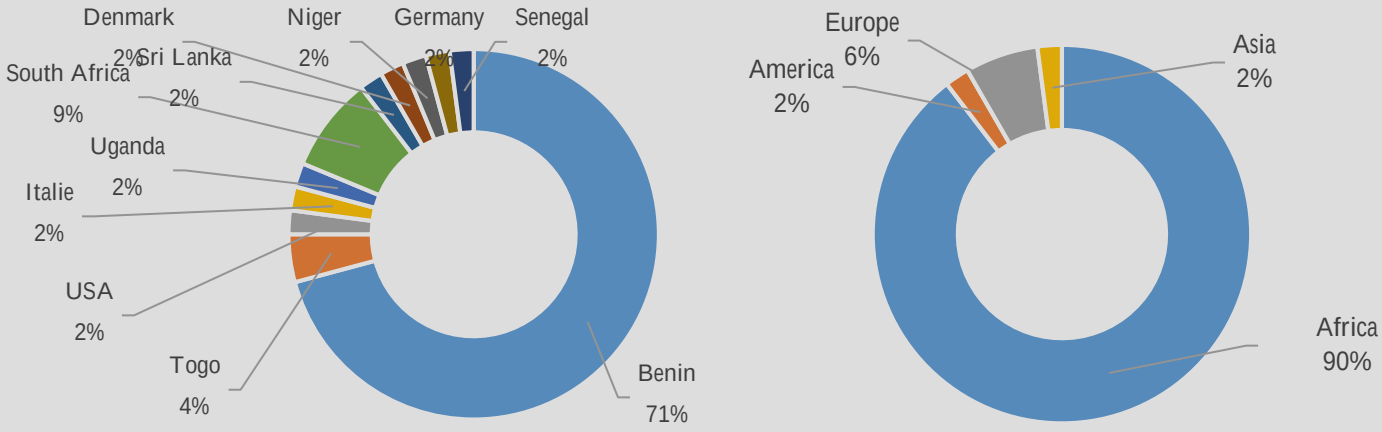


Figure 6. Countries (left) and continents (rights) of co-authors of publications of LABEF in 2017

4.5. Performance and highlights

Impact factor

In 2017, about 61 % of the scientific production of LABEF were published, in press or under review in international standards journals. About 53.5 % of the published or nearly published (in press) papers in 2017 was done in journal with impact factor. About sixty three percent of papers under review are processed in journal with impact factor. The cumulative impact factor in 2017 was 39.94 for papers published or nearly published (In press) and 11.84 for papers under review. This performance witnesses the quality of publication in LABEF.

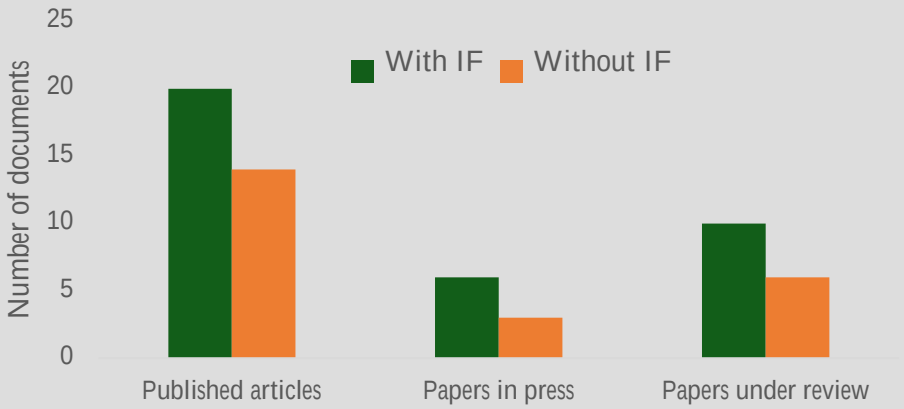


Figure 7. Proportion of publications with and without impact factor in 2017

About half of our published papers was in journal with at least one point for impact factor (Figure 7, Appendix 1.4-1.5). 1 one publication out of 5 was published in journal with at least 2 points for impact factor (Figure 7). The publications (including those in press or nearly accepted) with highest impact factors were in *Biodiversity and Conservation (*2.265), *Science of Food and Agriculture (*2.463), *Ecosystem Services (*4.072), *Oecologia* (3.1), *Biomass and Bioenergy* (3.2), *Forest Ecology and Management (*3.064).

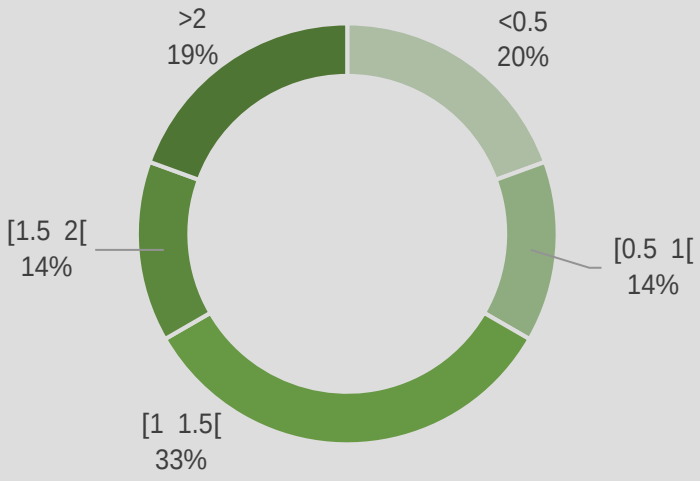


Figure 7. Ranges of impact factor of LABEF's publications in 2017

In comparison to 2016, LABEF keep the trend in high quality publications in 2017 (Figures 8). The number of publications in journal with impact factor increased steadily (33.33 %). Apart from the number of publications, the cumulative impact factor for published and nearly published increased (31.6 %), and suggest a remarkable work toward better quality of publications.

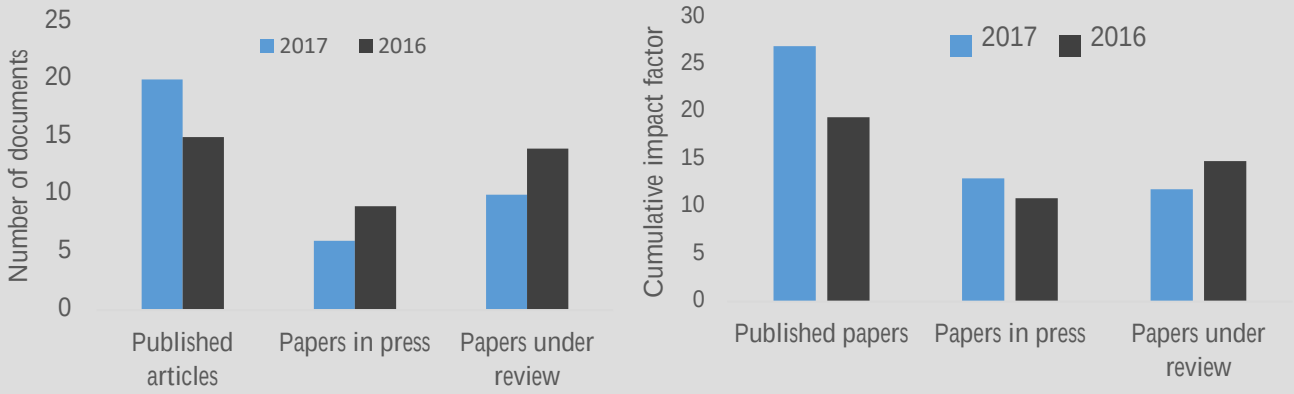


Figure 8: Comparison of publication (Left) and cumulative impact factors of publications in 2016 and 2017

Authorship and leadership in publications

We were strongly involved and kept a leadership on our publications in 2017. For instance, we were at least between the three first authors of 74 % of our publication while authoring as first position in 40 % of our articles. We assumed leadership position (Last authors) in 28 % of our publications). This trend evidences the strong involvement of LABEF and its members in research conception, implementation and publications in one way, and in another our capacity to partner with others institutions for transdisciplinary and larger research.

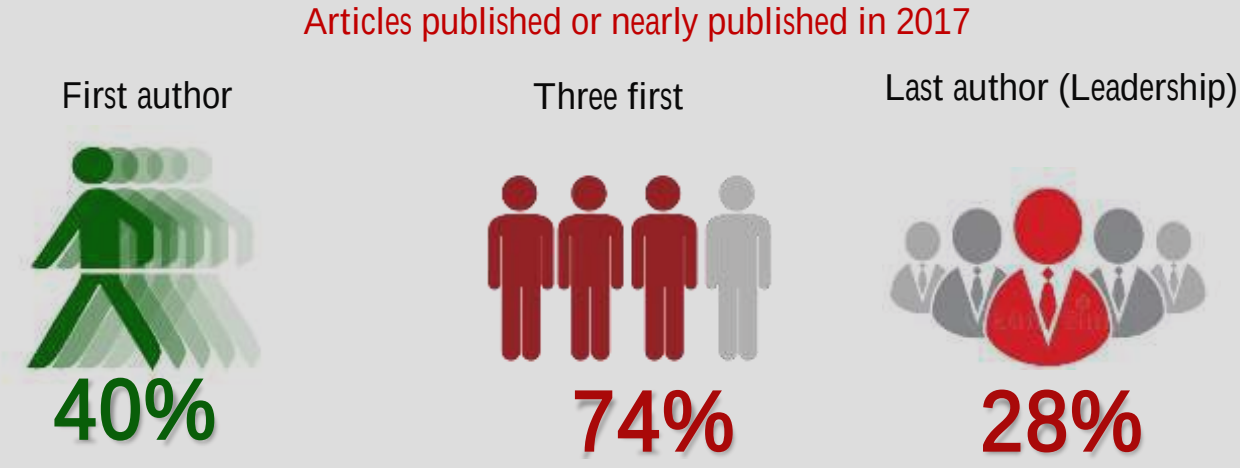


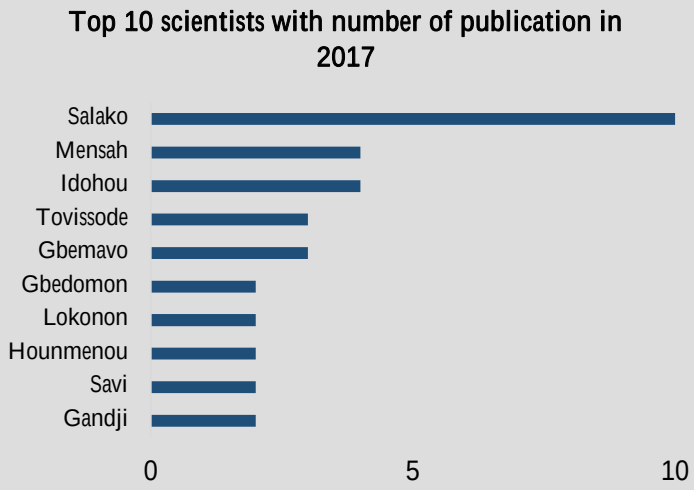
Figure 9. Authorship and leadership in publications of LABEF in 2017

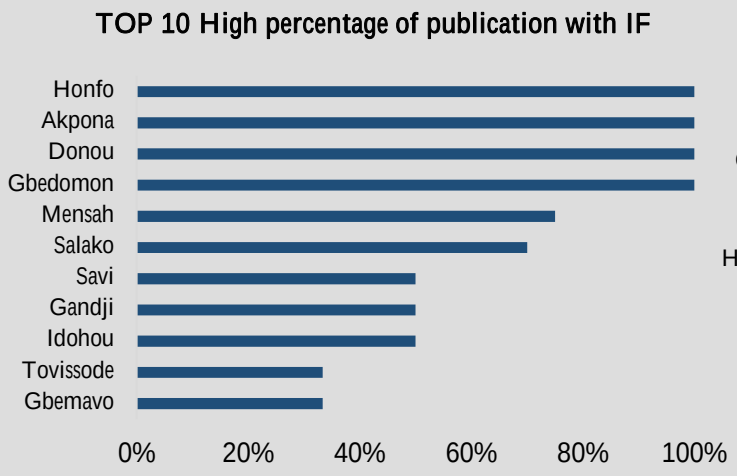
In term of individual contribution, some scientists, members of the Laboratory have been particularly actives. The top ten contributors in publications (apart from Prof Glèlè Kakaï, Director of the Laboratory) is headed by Drs Salako Valère (Scientific coordinator of LABEF) and Mensah Sylvanus (Adjunct of the Scientific coordinator of LABEF), with significant contribution of Drs Gbedomon, Gbemavo, Idohou, Akpona, Donou, and PhD students Gandji, Tovissode, Honfo, Lokonon and Savi.

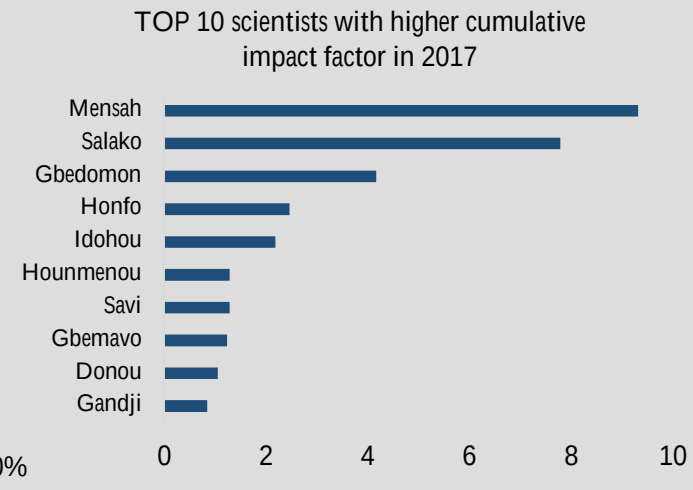
Prizes, Awards and recognitions

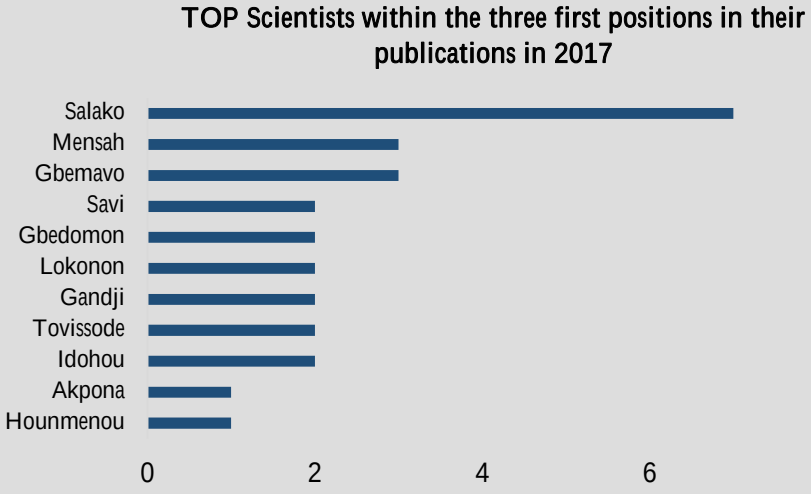
In 2017, our researchers have been celebrated for their excellence in Science. They received four prestigious Prizes and awards:

- The 2017 Young affiliates of the African Academy of Sciences (Dr Rodrigue IDOHOU)
- The 2017 Young affiliate of the World Academy of Sciences Regional Office for sub-Saharan Africa (TWAS ROSSA) (Dr Valère SALAKO)
- Nomination among the 2017 best African scientists (Pr Achille ASSOGBADJO)
- Full Professor in Forestry (CAMES) (Pr Achille ASSOGBADJO)
- Nomination as AGNES member of trustees 2017 (Pr Romain GLELE KAKAÏ)









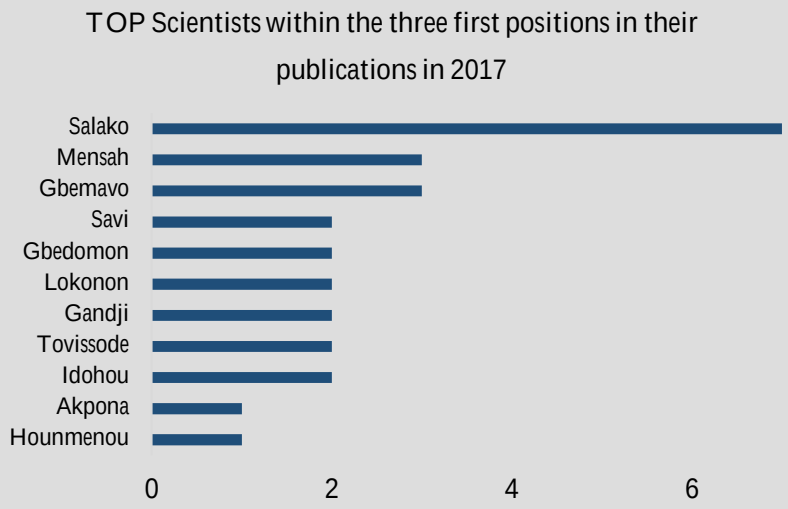


Figure 10. TOP Scientists of the year in LABEF

5. Participation in international conferences

In 2017, LABEF has registered participation of several of its researchers to local and international conferences. The researchers of the Laboratory have taken part in some 07 International conferences/workshops around the world. The lab representatives were mostly represented in conferences organized locally in Benin (29 %), in South Africa (29%) but also in Tanzania, Belgium and France. The researchers attended these events as participants, oral presenters, guest speakers or poster presenters. The conferences addressed biodiversity conservation, forestry and agriculture issues.

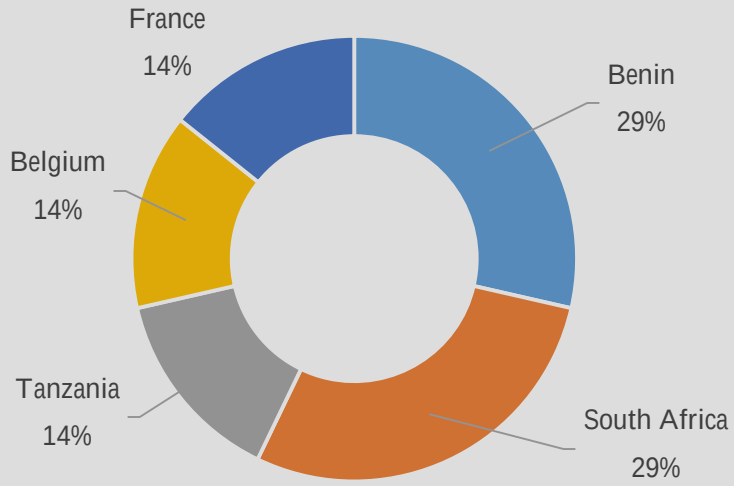


Figure 11. Host countries of conferences attended by LABEF members in 2017

CONTRIBUTION

to Africa capacity building

1. Graduate program in Biometry and Biostatistics

1.1. The PhD programme in Biometry

Since the academic year 2017-2018, the doctoral school of agronomic sciences and water resources is offering a PhD programme in Biometry. The programme is coordinated by Prof Glèlè Kakaï Romain with support of the Laboratoire de Biomathématiques et d'Estimations Forestières. Four members of LABEF who graduated from the Master programme in Biostatistics are currently enrolled in this programme (Tovissodé Frederic, Honfo Sewade Hermann, Amagnidé Aubin and Lokonon Bruno).

1.2. The Master programme in Biostatistics

The Master programme in Statistics with major in Biostatistics offers an extensive and unique training in recent statistical methods and tools toward their applications in Life sciences. At the end of the training, graduated students can easily go into professional life as Biostatistician or engage in research in Biostatistics by integrating a doctoral school. This training is open to Bachelor Degree holders in Life Sciences domains (agronomy, health, biology, environment, etc.), or in Mathematics/Statistics or Master Degree holders wishing to acquire knowledge and know-how in the field of data collection and analysis. The Master in Biostatistics has fully trained and released two batch of professional biostatisticians and data analysts. The 5th batch of students started in September 2017 and enrolled 23 students from three countries (Benin, Togo and Senegal). As for date, 88 students were trained or are mastering in the programme. They are from thirteen countries, covering four out the five Africa regions including West, East, Centre and South regions (See infographic x). The women participation has increased steadily since the inception of the Master, and reached a ratio of more than 1 woman for 4 men (25% of student enrollment since two batches). The programme is supported by an Intra-ACP Academic Mobility Programme (AGREEMENT NUMBER 2013-4177/001-001), RUFORMUM and the African Excellence Center for Mathematics Sciences and Application (ACE-MSA) with support of the World Bank Group.

What the Master aims to?

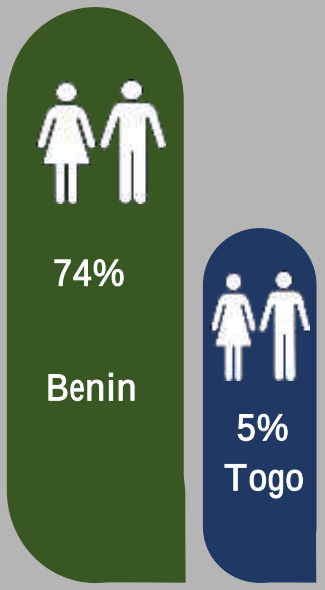
The field of Biostatistics is expanding. It deals with various sectors. The abilities this training gives in data collection, management, statistical analysis and valorization allow graduates to practice job of Biostatisticians in charge of Statistical Studies in various sectors. This programmes aims to provide Food Enterprises, Projects, Health Sector (Units of Clinical research), Department of Medical Information, etc.), Public and Private Research Institutions, Non-Governmental Organizations (NGO), International Organization (FAO, UNDP, World Bank, etc.) Education and International Research Institutions, with talented Biostatisticians and data analysts.

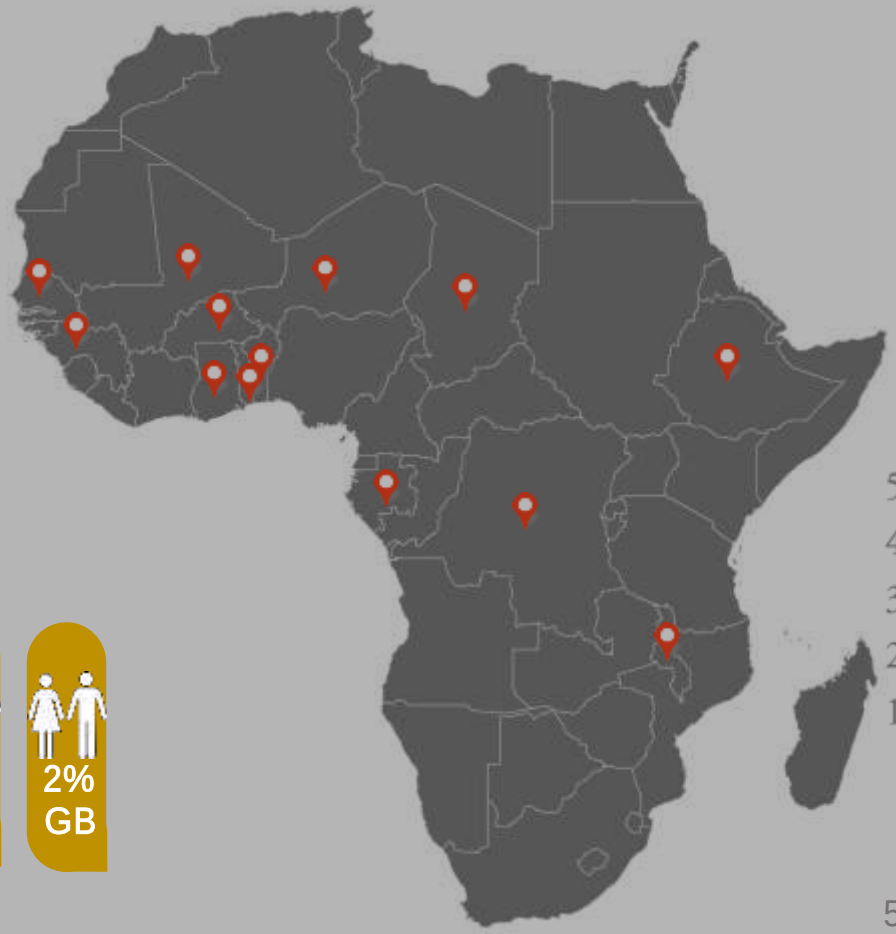
How to apply?

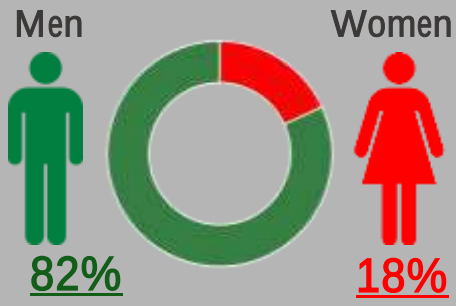
Visit the website www.labef-uac.org and fill in the online application form (http://labef-uac.org/application). Candidates from Benin could submit their applications to the secretary of the programme, located at the Laboratory of Biomathematics and Forests Estimations. Please visit the webpage of the Master for detailed information (http://labef-uac.org/en/master/)

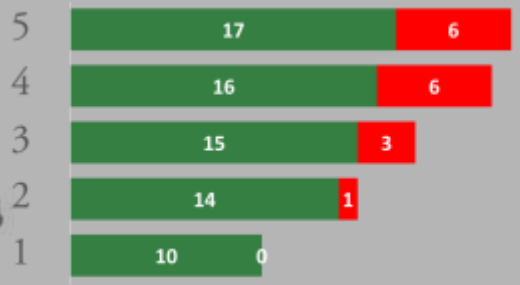
Labef

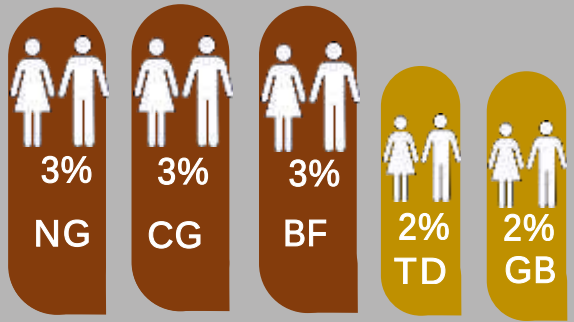
Master in Biostatistics Programme

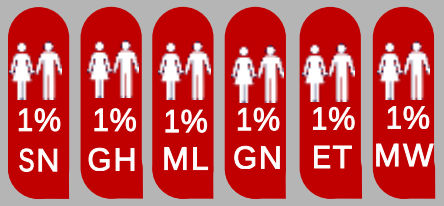








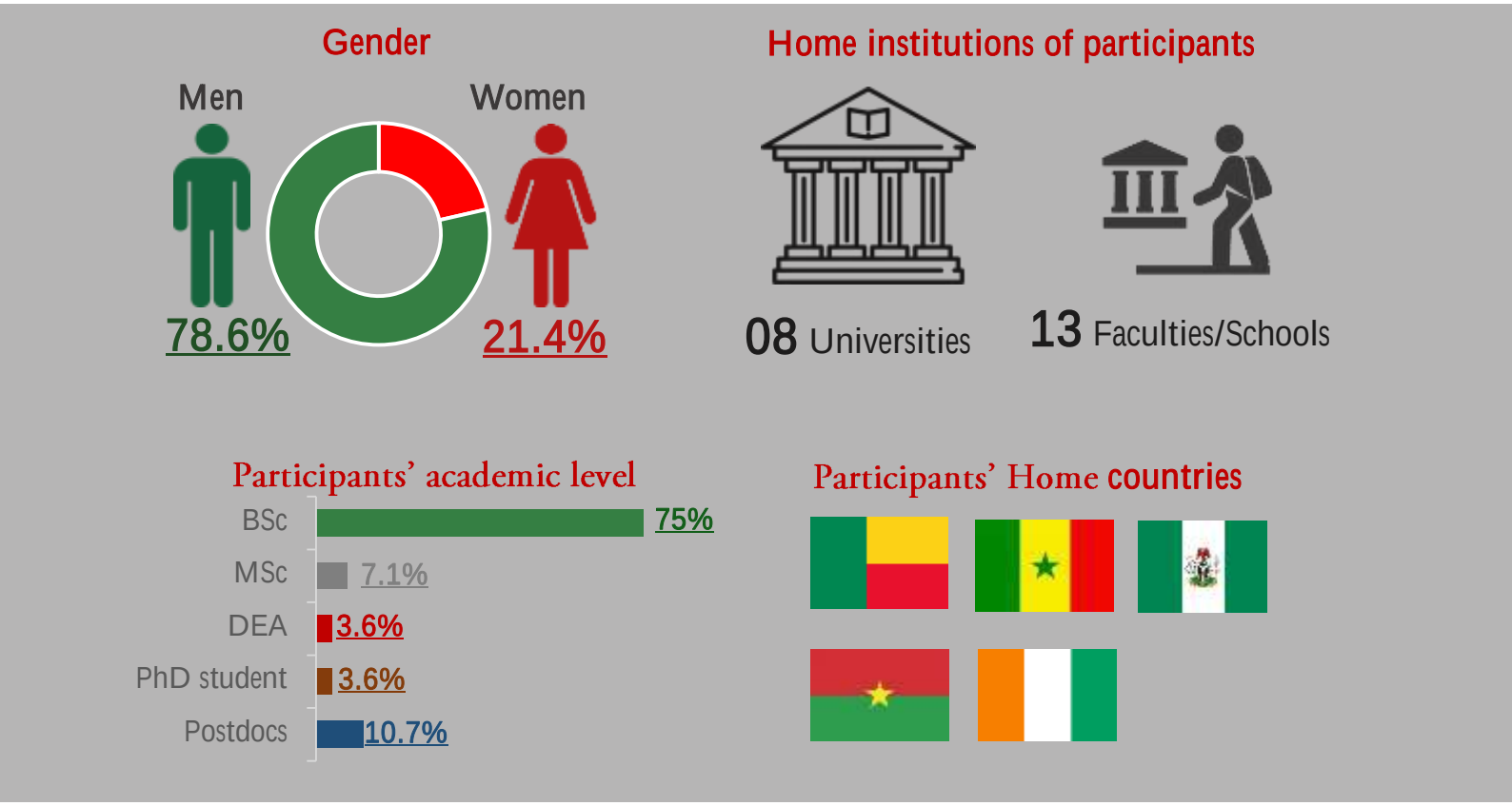




2. The Internship Programme

The Laboratoire de Biomathématiques et d'Estimations Forestières commits to build capacity of African scientist community and professional in statistics. In addition to the Master in Biostatistics which develop long term capacities, the LABEF houses a special internship programme.

The programme receive both local and foreign (international) interns from universities and research institutes. For a period of 3 to 8 months, this programmes enrolls undergraduate (BSc), graduate students (MSc, DEA, PhD students), and young researchers (Postdocs). Interns are introduced to basic statistics, R statistical software, thematic trainings, participate to training sessions and contribute to research activities in the Lab. Since its inception in 2016, the local internship programme trained 24 students (Infographic x). In 2017, we housed 24 interns, representing an increase of 18% and we hope to welcome more students this ongoing academic year.



Our interns came from three national universities (University of Abomey-Calavi, National, University of Agriculture of Benin and University of Parakou) and 5 regional universities including University of Ibadan (Nigeria), University of Fada N'Courma (Burkina Faso), University Prof Ki-Zerbo Ouaga1 (Burkina Faso), University Félix Houphouët-Boigny (Ivory Coast) and University Cheik-Anta Diop (Senegal).

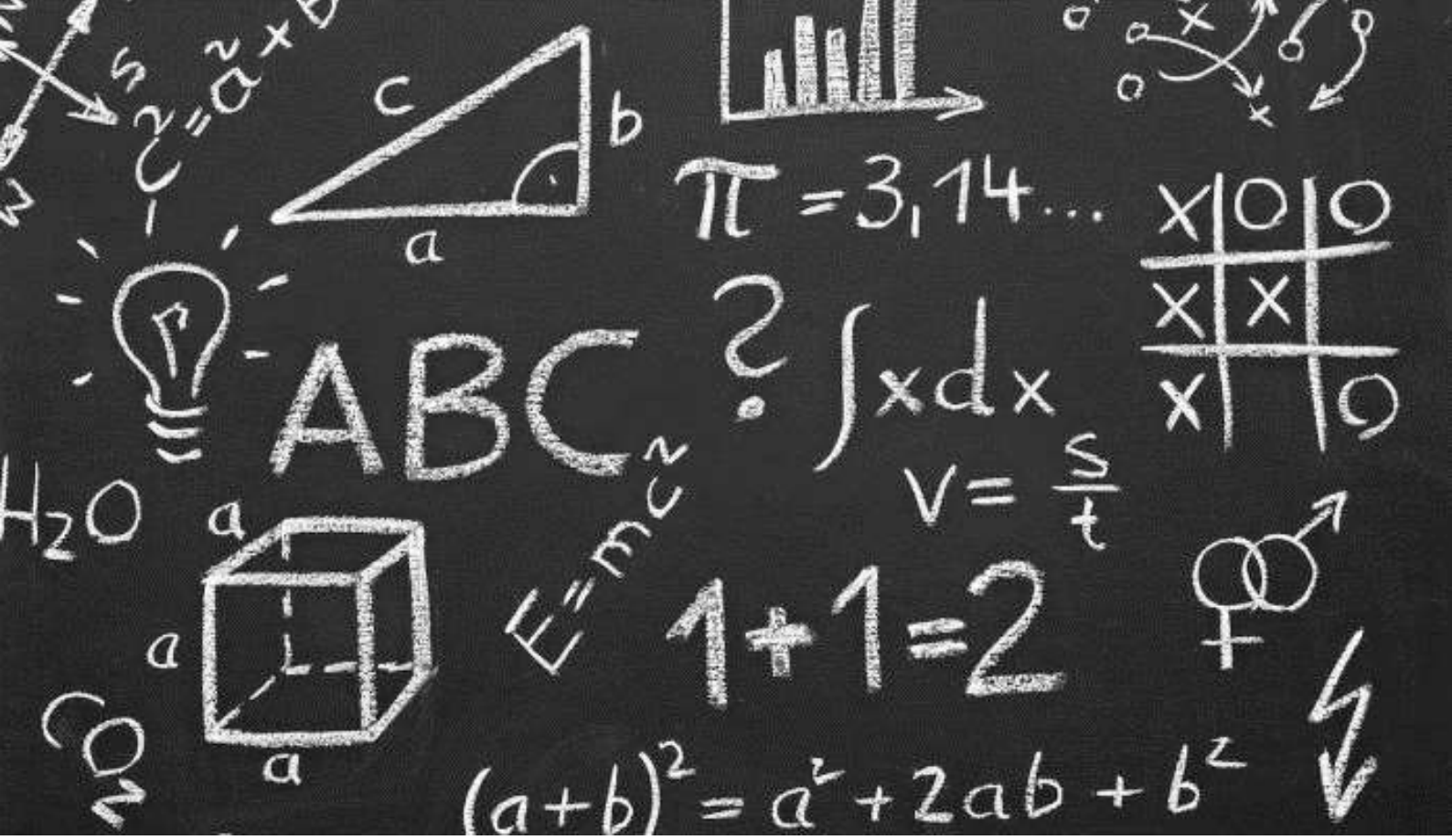
For details, requirement and condition for participating in the internship programme of LABEF, please contact Dr Salako Kolawole Valère (salakovalere@gmail.com ; for Foreign candidates) and Dr Jean-Didier Akpona (ajeandidier@gmail.com ; local candidates).

3. Conferences and seminar organized by LABEF

Ten free-of-charge scientific seminars took place at LABEF during the year 2017, covering different issues and disciplines. Participants from both Experts, researchers, practitioners and policy markets attended enjoyed debate and experience sharing on the following topics:

1. Scientific research and the current challenges of the forest sector in Benin
2. Comment analyser les bénéfices des aires protégées pour développer des cercles vertueux d'incitation à la conservation – une démarche basée sur les filières
3. Estimation des distances de dispersion génique, du pollen et des graines, à l'aide des marqueurs moléculaires
4. Introduction to web resources
5. Application of mixed model analysis for crop improvement: prediction of genetic values with BLUP and Bayesian methods
6. Caractérisation technologique du bois au Bénin: état des lieux et perspectives
7. Biodiversity Informatics for conservation and sustainable utilization of natural resources
8. A new call for a paradigm shift and theory driven ethnobotany
9. Uncovering the evolutionary history and historical biogeography of cycad
10. Diversity and Biomass relationship in forest ecosystems: from political to scientific considerations

For details about the conference and seminars in 2017, see Appendix 6 and our website (www.labef-uac.org)



APPENDICES

Appendix 1: Scientific activities report of the LABEF

Appendix 1.1. Completed PhD thesis in 2017

N°	Student full name	Research topics	Field of Research
1	Donou Hounsode Marcel	Usage, Ecologie et Biologie de la Conservation des palmiers raphias au Bénin (Afrique de l'Ouest)	*Forest resources management*
2	Akpona T. Jean Didier	Biodiversity, Prioritization, population ecology and conservation of woody plant species in Benin (West Africa)	*Forest resources management*

Appendix 1.2. Ongoing PhD thesis

N°	Student full name	Level	Research topics	Field of Research
1	Kisito Gandji	3th year	Modelling ethnobotanical patterns of *Moringa oleifera* Lam. in Benin (West Africa)	Ethnobotany
2	Eclou Innocent	2rd year	Assessment and analysis of agro-ecological aspects of cotton farming systems for a sustainable cotton production in Benin.	*Environmental chemistry and agronomy*
3	Atanasso A. Justin	2rd year	Effects of abiotic and biotic factors on the early recruitment of the threatened *Afzelia africana* Sm. ex Pers. (Fabaceae-Ceasalpinioideae) in the Pendjari Biosphere Reserve (Benin, West Africa)	*Conservation biology*
4	Gnonlonfoun Isidore	1st year	Dynamics of savanna plants: effects of trophic interactions between elephants and woody plants in Pendjari Biosphere Reserve in Benin, West Africa	*Savanna ecology, Population ecology*
5	Houndonougbo S. H. Juliano	1st year	Ecology, conservation and domestication of the African locust bean tree *Parkia biglobosa* (Jack.) R. Br. (Mimosaceae) in Benin, West Africa	*Conservation biology*
6	Amagnide G. A. Y. Guénolé	1st year	Empirical comparison of plotless sampling techniques in vegetation studies	*Biometry*
7	Hounmenou Castro	1st year	Global optimization in multilayer perceptron neuronal networks	*Biomettry*
8	Lokonon Bruno	1st year	Empirical comparison of parameter estimation methods used in generalized linear mixed model (GLMM) with applications on ecological data	*Biometry*
9	Honfo Hermann	1st year	Linear mixed effects models for fitting multivariate longitudinal data: application to natural regeneration of *Adansonia digitata* L.	*Biometry*
10	Tovissode Frederick	1st year	Performance of Generalized Linear and Nonlinear Mixed Models under flexible semi-non parametric and parametric distributions: applications to plant-plant interactions and gene dispersal in Afzelia africana	*Biometry*
11	Savi Merveille	1st year	Advanced system dynamic analysis approach to enhance the control of malaria in West Africa	*Biometry*

Appendix 1.3. Completed Master in 2017

N°	Student full name	Research topics	Field of Research
01	Salako Kolawole Valère	Empirical assessment of the effect of serial auto-correlation on stochastic life table response experiment (SLTRE) estimates: application to the demography of *Khaya senegalensis*	*Biostatistics*
02	SERO Nadedga	Relative performance of popular coding structures for contrasts analysis	*Biostatistics*
03	ANAGO Mélain	Performances agroécologiques de trois systèmes de production de coton	*Agronomy*
04	GOSSOU BAH Daniel	Geographical distribution, population structure of *Pterocarpus erinaceus* Poir across ecological regions in Benin	*Forest and ecology*
05	HINSON Abel Dieudonné	Analyse des interactions spatiales entre espèces du sous-bois et de la strate arborescente dans la Forêt Classée de la Lama: implications pour les enrichissements	*Forest ressources management*
06	ZANVO Serge G. E. M.	Approche méthodologique de quantification du stock de Carbone dans une forêt marécageuse: cas de la forêt de Lokoli (Sud-Bénin)	*Forest Estimations*
07	HOUNSOUDINDIN Guillaume	Developing best agro-ecological practices for African baobab tree *Adansonia digitata L.* leaves production in smallholders farming systems in Benin	*Agroforestry*
08	FANTONDJI Benjamin	Impacts of land use on the demographic and spatial structure of baobab (*Adansonia digitata*) in the semi-arid region of Benin (West-Africa)	*Ecology*
09	ADJALLA C. Christian	Evaluation de la banque de graines du sol de la forêt classée de la Lama	*Seed ecology*
10	TOFFA Yessia	Home gardens along the Urban Rural continuum of Southern Benin: Plant diversity, functions and contribution to human wellbeing	*Agrobiodiversity*
11	ABIKOU Bienvenu	Effet des adventices sur la croissance et la biomasse du baobab africain, *Adansonia digitata*	*Agronomy*
12	DONHOUEDE Janine	Evaluation ethnobotanique, éco-phénotypique et propagation de *Annona senegalensis* au Nord-Bénin	*Ethnobotany*
13	DAI Emilienne	Evaluation ethnobotanique, éco-phénotypique et propagation de *Annona senegalensis* au Sud-Bénin	*Ethnobotany*
14	GNANSOUNOU Constant	Ethnobiologie, perceptions locales des services écosystémiques et structure des mangroves de la commune de Grand-Popo	*Ecosystem services*
15	DOSSOU Euden	Gouvernance locale, ethnobiologie, perceptions locales des services écosystémiques et structure des mangroves du Sud-Bénin	*Natural resources gouvernance*
16	DO-REGo Eunock	Etude éco-géographique et distributions des habitats favorables aux parents sauvages de plantes cultivées au Bénin	*Eco-geography*
17	ALLAGBE Freddy	Analyse comparative de l'effet des adventices sur la reprise et la croissance des boutures d'une plante cultivée (*Manihot esculenta*) et de son parent sauvage (*Manihot glaziovii*) au Sus-Bénin	*Agronomy*
18	LOHAHOUEDE Hilarion	Gestion intégrée des terroirs riverains de la forêt classée trois rivières: analyse des stratégies d'adaptation et de conservation endogènes	*Natural resources governance*
19	HOUINATO Fréjus	Etude ethnobotanique des ligneux utilitaires des forets de la commune de Djougou pour la conservation et la domestication d'espèces ligneuses importantes	*Ethnobotany*
20	KEGBE Mauricel	Ecophenotypic Variation in Fruits Traits and Provenances Test of *Borassus aethiopum* Mart. in Benin (West Africa): implications for Breeding	*Genetics*

N°	Student full name	Research topics	Field of Research
21	Houessou Ariel	Analysis of Baobab (*Adansonia digitata* L.) tree demographic according to land- use type in the three biogeographical areas of Bénin (West Africa)	*Ecplpgy*

Appendix 1.4. Articles published in peer-review journal with IF in 2017

Disciplines	N°	Authors' Names	Title of the article	Journals	IF
Entomology	1	Paraïso A., Paraïso G., Salako V. K., Abiola W., Kelomey A., Glele Kakaï R., Edorh P. A., Baba-Moussa L., Sanni A. and Glitho I. A.	Compliance of the Morphometric Characteristics of Bees in Benin with Those of Apis mellifera Adansonii	*Journal of Entomology*	1.167
Biostatistics	2	Savi K M., Mangamana T. E., Deguenon M. J., Hounmenou G. C., and Glèlè Kakaï R.	Determination of Lethal Concentrations Using an R Software Function Integrating the Abbott Correction	*Journal of Agricultural Science and Technology*	0.813
Agronomy	3	Ba R., Alfa T., Gbaguidi F., Novidzro M. K., Dotse K.,4 Koffi Koudouvo, Houngue U., Donou H. T. M., Koumaglo H. K., Ameyapoh Y., and Baba-Moussa L.	Maize Fungal Growth Control with Scopoletin of Cassava Roots Produced in Benin	*International Journal of Microbiology*	1.057
Forestry	4	Alohou E. C., Gbemavo D. S. J. C., Mensah S., and Ouinsavi C.	Fragmentation of Forest Ecosystems and Connectivity Between Sacred Groves and Forest Reserves in Southeastern Benin, West Africa	*Tropical Conservation Science*	1.238
Forestry	5	Fandohan A. B., Chadare F. J., Gouwakinnou G. N., Tovissode C. F., Bonou A., Djonlonkou S. F. B., Houndelo L. F. H., Sinsin C. L. B., Assogbadjo A. E.	Usages traditionnels et valeur économique de *Synsepalum dulcificum* au Sud-Bénin	*Bois et forêts des tropiques*	0.283
Forestry and conservation	6	Akpona J. D. T., A. E. Assogbadjo, Fandohan V, Glèlè Kakaï R.	Inventory and multicriteria approach to identify priority commercial timber species for conservation in Benin	*Bois et forêts des tropiques*	0.283
Forestry and conservation	7	Assogba G. A., Fandohan A. B., Salako V. K., Assogbadjo A. E.	Usages de *Bombax costatum* (Malvaceae) dans les terroirs riverains de la réserve de biosphère de la Pendjari, République du Bénin	*Bois et forêts des tropiques*	0.283
Agrobiodiversity and conservation	8	Gbedomon C. R., Salako K. V., Fandohan B. A., Idohou A.F.R., Glèlè Kakaï R. and Assogbadjo E. A.	Functional diversity of home gardens and their agrobiodiversity conservation benefits in Benin, West Africa	*Journal of Ethnobiology and Ethnomedicine*	1.903
Ecology	9	Houndonougbo J. S. H., Salako V. K., Idohou R., Azihou F. A., Assogbadjo A. E., Glèlè Kakaï R.	Local perceptions of interactions between elephants and *Borassus aethiopum* Mart. (Arecaceae) in the Pendja	*Bois et forêts des tropiques*	0.283
Statistics	10	Asamoah-Boaheng M., Adebanji A., Glèlè Kakaï R.	Small population size and large dimension performance of some equal mean discrimination functions	*International Journal of Mathematics and Statistics*	0.415

Disciplines	N°	Authors' Names	Title of the article	Journals	IF
Environment	11	Mensah S., Veldtman R., Seifert T.	Potential supply of floral resources to managed honey bees in natural mistbelt forests	*Journal of Environmental Management*	4.01
Ecology	12	Assogbadjo E. A., Mensah S., Glèlè Kakaï R.	The relative importance of climatic gradient versus human disturbance in determining population structure of *Afzelia africana* in the Republic of Benin	*Forests, People and the Environment*	1.951
Agrobiodiversity and conservation	13	Gbedomon. C. R., Salako K. V., Adomou C. A., Glèlè Kakaï R., Assogbadjo E. A.	Plants in traditional home gardens: richness, composition, conservation and implications for native biodiversity in Benin	*Biodiversity and Conservation*	2.265
Food science	14	Chadare, F. J., Madode, Y. E., Fanou-Fogny, N., Kindossi, J. M., Ayosso, J. O., Honfo, S. H., Kayodé, A. P., Linnemann, A. R. and Hounhouigan, D. J.	Indigenous food ingredients for complementary food formulations to combat infant malnutrition in Benin: a review	*Science of Food and Agriculture*	2.463
Ecology	15	Salako V. K., Houéhanou T. H., Kowiyou Y., Assogbadjo A. E., Akoègninou A.; Kakaï, Glèlè L. R.	Patterns of elephant utilization of *Borassus aethiopum* Mart. and its stand structure in the Pendjari National Park, Benin, West Africa.	*Tropical Ecology*	1.041
Forestry	16	Inoussa M. M., Padonou A. E.,. Lykke A.M., Glèlè Kakaï R., Bakasso Y. A., Mahamane A., Saadou M.	Contrasting population structures of two keystone woodland species of W National Park, Niger	*South African Journal of Botany*	1.427
Ecosystem services	17	Mensah. S., Veldtmanc R., Assogbadjo E. A., Hama C., Glèlè Kakaï R., Seiferta T.	Ecosystem service importance and use vary with socio-environmental factors: A study from household-surveys in local communities of South Africa	*Ecosystem Services*	4.072
Seed science	18	Vihotogbé R., Watson C., Glèlè Kakaï R., Wichern F., Sinsin B., Gebauer J.	Effects of salinity on seedling emergence and early seedling growth of *Irvingia gabonensis* (Irvingiaceae)	*Seed Science and Technology*	0.396
Forestry	19	Gandji K, Salako K. V., Assogbadjo E. A., Orekan O. A. V., Glèlè Kakaï L. R. & Sinsin A. B.	Evaluation of the sustainability of participatory management of forest plantations: the case study of Wari-Maro Forest Reserve, Republic of Benin	*Southern Forest*	0.848

Appendix 1.5. Articles published in peer-review journal without IF in 2017

Disciplines	N°	Authors' Names	Title of the article	Journals
Forestry and Conservation	1	Assogbadjo A.E., Idohou R., Chadare F.J., Salako V.K., Djagoun C.A.M.S., Akouehou G. and Mbairamadji J.	Diversity and prioritization of non timber forest products for economic valuation in Benin (West Africa)	*African Journal of Rural Development*
Agroforestry	2	Atapattu A. A. A. J. , Senarathne S. H. S., Raveendra S. A. S. T., Egodawatte W. C. P., and Mensah S.	Effect of short term agroforestry systems on soil quality in Marginal coconut lands in sri lanka	*Agriculture Research Journal*

Disciplines	N°	Authors' Names	Title of the article	Journals
Entomology	3	Pomalégni1 S.C.B., Gbemavo D.S.J.C., Kpadé C.P., Kenis M. and Mensah G.A.	Traditional use of fly larvae by small poultry farmers in Benin	*Journal of Insects as Food and Feed*
Forestry and Conservation	4	Sèwadé C., Azihou F. A., Fandohan B. A. and Houinato M.	Leaf biomass modeling, carrying capacity and species-specific performance in aerial fodder production of three priority browse species *Afzelia africana*, *Pterocarpus erinaceus* and *Daniellia oliveri* in Benin	*Livestock Research for Rural Development*
Forestry and Conservation	5	Padonou A. E., Tovissodé F.C., Idohou R., Salako K. V. , Fantondji L., Vihotogbé R., B. Fandohan B. and Assogbadjo E. A.	Pilot assessment of locally acknowledged morphotypes of *Irvingia gabonensis* (Aubry-Lecomte) Baill. in southwestern Benin (West Africa)	*International Journal of Tropical and Subtropical Horticulture*
Agronomy	6	De Souza F. J., Gbemavo C. J. D., Gnangle C. P., Azontonde A., Chabi Adjobo M. A., Behingan M. B., Glele Kakaï R.	Effet du pourghère (Jatropha curcas l.) sur la performance agronomique du maïs (*zea mays* l.) Et du manioc (*manihot esculenta* crantz) et sur la fertilité du sol au sud-bénin	*Annales des sciences agronomiques*
Ethnobotany	7	Sèwadé C., Lokonon E. B., Azihou F. A., Akouèhou S. G., Mensah A. G., Glèlè Kakaï L. R., & Houinato M. R. B.	Use diversity and farmer's preference of 48 local multipurpose fodder trees : a comparative analysis of three sociolinguistic groups of benin	*Annales des sciences agronomiques*
Ethnobotany	8	Ahoyo C. C., Houehanou D. T., Yaoitcha S. A., Prinz K., Assogbadjo E. A., Adjahossou G. S. C., Hellwig F., Houinato B. R. M.	A quantitative ethnobotanical approach toward biodiversity conservation of useful woody species in Wari-Maro forest reserve (Benin, West Africa)	*Environment, Development and Sustainability*
Ethnobotany	9	Lokonon E. B., Mangamana T. E., Glèlè Kakaï R. and Sinsin B.	Assessing use, diversity and local conservation priorities of woody species within agroforestry systems along Ouémé catchment in Benin (West Africa)	*Ethnobiology and Conservation*
Forestry	10	Agbani O. P., Gandji K., Tovissodé F., Karen H., Sinsin B.	Production Fruitière De Quatre Essences Ligneuses dans La Forêt De Nassou En zone soudanienne du Bénin	*European Scientific Journal*
Forestry and Conservation	11	Atanasso J. A., Chadare F. J., Padonou E. A., Ahouansinkpo E., Koura K., Houehanou T., A. E. Assogbadjo, Glele Kakaï R., Sinsin B.	Habitats and utilizations of *lippia multiflora* Moldenke : local perception of four ethnic Groups from benin (west africa)	*Agronomie Africaine*
Zoothechnic	12	Kate S., Hounmenou G. C., Agbangba E. C., Deguenon S. D. D., Gbaguidi M., Nakou K. G., et Sinsin B.	Effets de l'indice de température et d'humidité relative de l'air sur la fécondité des bovins en zone agropastorale de Banikoara (Nord-Bénin)	*e-Journal of Science & Technology*
Statistics	13	Savi K. M., Dossou-Yovo R. E. A., Glèlè Kakaï L. R.	Monte Carlo Simulations for Assessing the Performance of Permutation of Residuals Methods in One-way ANOVA	*Turkiye Klinikleri J Biostat*
Agronomy	13	Dayou E. D, Zokpodo K. L. B, Glèlè Kakaï A. L. R., Ganglo C. J.	Impacts of the conventional tillage tools and reduced tillage on the soil fertility preservation: critical review	*Journal of Applied Biosciences*
Forestry	14	Goussanou A. C., Tente C. A., Akouehou G., Salako K. V., Glele Kakaï L. R., Sinsin A. B.	Structural and spatial patterns of Isoberlinia species in a disturbed community forest (Benin, West Africa)	*Journal of Forestry Faculty*

Appendix 1.6. Articles in press in peer-review journal with IF 2017

Disciplines	N°	Authors' Names	Title of the article	Journals	IF
Functional Ecology	1	Mensah S, du Toit B, Seifert	Diversity-biomass relationship across forest layers in multispecies Afromontane natural forests: implications for niche complementarity and selection effects	Oecologia	3.1
Forest estimations	2	Dimobe K, Mensah S, Ouédraogo A, Goetze D, Porembski S, Thiombiano A.	Aboveground biomass partitioning and additive models based on seemingly unrelated regression for two combretaceae species in West Africa.	Biomass and Bioenergy	3.2
Agroforestry	3	Salako, V. K., Kénou, C., Dainou, K., Assogbadjo, A. E., & Kakaï, R. G.	Impacts of land use types on spatial patterns and neighbourhood distance of the agroforestry palm *Borassus aethiopum* Mart. in two climatic regions in Benin, West Africa.	*Agroforestry Systems*	1.170
Forestry	4	Mensah, S., Pienaar, O. L., Kunneke, A., du Toit, B., Seydack, A., Uhl, E., … & Seifert, T.	Height–Diameter allometry in South Africa's indigenous high forests: Assessing generic models performance and function forms.	*Forest Ecology and Management*	3.064
Eco-geograpghy	5	Vihotogbé, R., Idohou, R., Gebauer, J., Sinsin, B., & Peterson, A. T.	Estimation of cultivable areas for *Irvingia gabonensis* and *I. wombolu* (Irvingiaceae) in Dahomey-Gap (West Africa).	*Agroforestry Systems*	1.170
Genetics	6	Gbaguidi, A. A., Dansi, A., Dossou-Aminon, I., Gbemavo, D. S. J. C., Orobiyi, A., Sanoussi, F., & Yedomonhan, H.	Agromorphological diversity of local Bambara groundnut (*Vigna subterranea* (L.) Verdc.) collected in Benin.	*Genetic Resources and Crop Evolution*	1.294

Appendix 1.7. Articles in press in peer-review journals without IF in 2017

Disciplines	N°	Authors' Names	Title of the article	Journals
Ethnobotany	1	Savi, M. K., R. Noumonvi, F. J. Chadaré, K. Daïnou, V. K. Salako, R. Idohou, A. E. Assogbadjo, and R. G. Kakaï	Synergy between traditional knowledge of use and tree population structure for sustainability of Cola nitida (Vent.) Schott. & Endl in Benin (West Africa).	*Environment, Development and Sustainability*
Climate change	2	Atidegla, H.S.C & Hounmenou, C.	Adaptation des producteurs à la variabilité climatique au Sud bénin : cas de la plaine inondable de Gbessou.	*Annales des sciences agronomiques*
Ethnobotany	3	Sèwadé, C., Lokonon, B.E., Azihou, A.F., Akouèhou, G.S., Mensah, G.A., Glèlè Kakaï, R., & Houinato, M.R.B.	Use diversity and farmer's preference of 48 local multipurpose fodder trees: a comparative analysis of three sociolinguistic groups of Benin;	*Annales des sciences agronomiques*

Appendix 1.8. Articles under review in peer-review journal with IF in 2017

Disciplines	N°	Authors' Names	Title of the article	Journals	IF
Ecology	1	Goudegnon O.A.E., Salako V.K., Gouwakinnou N.G., Oumorou M.	Morphological variation in trees, fruits and seeds traits of *Lannea microcarpa* in the Sudanian zone of Benin, West Africa: implication for its domestication.	*Fruits*	0.634
Agroforestry	2	Gandji K., Salako V.K., Tovissodé F.C., Assogbadjo A.E., Glèlè Kakaï R.L.	Morphological diversity of *Moringa oleifera* Lam. as related to ecological conditions and farmers' management practices in Benin (West Africa).	*Agroforestry systems*	1.170
Agroforestry	3	Gandji K., Salako V.K., Fandohan B., Assogbadjo A.E., Glèlè Kakaï R.L.	Factors determining the use and cultivation of Moringa oleifera Lam. in Republic of Benin.	*Economic Botany*	1.582
Ethnobotany	4	Agbani P.O., Kafoutchoni K.M., Salako V.K., Gbedomon R.C., Kégbé A.M., Karen H., Sinsin B.	Traditional ecological knowledge-based assessment of threatened woody species and their potential substitutes in the Atakora mountain chain, a threatened hotspot of biodiversity in Northwestern Benin, West Africa.	*Journal of Ethnobiology and Ethnomedicine*	1.903
Agroforestry	5	Salako V.K., Vihotogbé R., Houéhanou T., Sodé I., Glèlè Kakaï R.	Predicting the potential impact of climate change on the declining agroforestry species *Borassus aethiopum* Mart. in Benin: a mixture of geostatistical and SDM approach	*Agroforestry systems*	1.170
Ethnobotany	6	Neelam, R., Gbedomon, R.C., Amhad M., Salako, V., Zafar, M., Malik, K.	Traditional knowledge on herbal drinks among indigenous communities in Azad Jammu and Kashmir, Pakistan	*Journal of Ethnobiology and Ethnomedicine:*	1.903
Forest ecology	7	Hounkpèvi A., Kouassi K. E. & Glèlè Kakaï R.	Effects of climatic variability and local environment patterns on the occurrence and population structure of African black plum (*Vitex doniana* Sweet)	*Tropical ecology*	1.041
Conservation Biology	8	Assogba G.A., Fandohan A.B., Gandji K., Salako K.V., & Assogbadjo A. E.	Bombax costatum (Malvaceae): Review on state of knowns, unknowns and prospects in West Africa.	*Biotechnologie Agronomie Société Environnement (BASE)*	0.676
Forestry	9	Akpona Tèwogbade Jean Didier., Akpona Adéloui Hugues., Assogbadjo Achille and Glèlè Kakaï Romain	Biodiversity, ethnobotanical knowledge and socioeconomic factors supporting local people's choice of woody plants species in Benin (West Africa).	*Southern Forest*	0.848
Forest Ecology	10	Romaric Vihotogbe, Rodrigue Idohou, Jens Gebauer, Brice Sinsin and A. Townsend Peterson	Estimation of cultivable areas for *Irvingia gabonensis* and *I. wombolu* (Irvingiaceae) in Dahomey-Gap (West Africa)	*Agroforestry systems*	0.910

Appendix 1.10. Articles under review in peer-review journal without IF in 2017

Disciplines	N°	Authors' Names	Title of the article	Journals
Biostatistics	1	Lokonon E. B. and Glèlè Kakaï R.	Effect of overdispersion and sample size on the performance of Poisson model and its extensions in frame of Generalized Linear Models (GLMs)	*International Journal of Applied Mathematics and Statistics*
Agroforestry	2	Lokonon E. B., Tchandao Mangamana E., Gnonlonfoun I., Akpona J. D., Assogbadjo A., Glèlè Kakaï R. and Sinsin B.	Knowledge, valuation and prioritization of 46 woody species for conservation in agroforestry systems along Ouémé catchment in Bénin (West Africa).	*Environment, Development and Sustainability*
Hydrology	3	Nounangnonhou T. C., Fifatin F-X. N., Lokonon E. B., Acakpovi A., Sanya E. A.	Modelling and Prediction of Ouémé (Bénin) River Flows by 2040 Based on GR2M Approach.	*Larhyss journal*
Ethnobotany	4	Gandji K., Gbedomon R. C., Chadare F. J., Moshobane C. M., Salako V. K., Assogbadjo A. E., Glèlè Kakaï R. L.	Factors influencing the specific uses of Moringa oleifera Lam. in Benin (West Africa).	*Annales des Sciences Agronomiques*
Agroforestry and ethnobotany	5	Gandji K., Chadaré F. J., Idohou R., Salako V. K., Assogbadjo A. E. and Glèlè Kakaï R. L.	Status and utilisation of Moringa oleifera Lam: a review.	*African Crop Science Journal.*
Applied statistics	6	Aubin Amagnide, Micheline Gbeha & Romain Glèlè Kakaï	Fitting an optimal variance-covariance	*Applied statistics*

Appendix 1.10. Technical Reports and books in 2017

Field of research	N°	Authors' Name	Title	References
Food Science	1	Assogbadjo, Achille Ephrem Idohou Rodrigue; Kafoutchoni Konoutan Médard; Kegbe Mauricel	Examen Stratégique Faim Zéro. Rapport thématique Environnement et Sécurité Alimentaire.	Assogbadjo, AE; Idohou, R; Kafoutchoni, KM; Kegbe, M. (2018). Examen stratégique Faim zéro: Rapport thématique Environnement et Sécurité alimentaire. Programme Alimentaire Mondial.
Agriculture	2	Hounsou-Dindin, G., Assogbadjo, A.E., Idohou, R., Salako. V.K. & Glèlè Kakaï, R.	Morphological variation of baobab fruits and seeds traits in smallholders farming systems in Benin: a preliminary study on baobab leaves production	RUFORUM Working Document Series
Agriculture and Food security	3	Gbedomon, Rodrigue Castro	Agriculture & food security in Africa. Compendium of knowledge products.	Africa for results initiative, the African Capacity Building Foundation, Harare, Zimbabwe, 56p.

Natural Resources governance	4	Gbedomon, Rodrigue Castro	Natural Resourcesin Africa. Compendium of knowledge products.	Africa for results initiative, the African Capacity Building Foundation, Harare, Zimbabwe, 51p.
Mobilization of Financial Resource	5	Gbedomon, Rodrigue Castro	Mobilizing Financial Resources from the Informal Sector: Presumptive Tax Experience in Zimbabwe. Knowledge product,	Africa for results initiative, the African Capacity Building Foundation, Harare, Zimbabwe.
Business environments	6	Gbedomon, Rodrigue Castro	Improving the business environment in COMESA region: Review of country reforms, perspectives and policy recommendations. Knowledge product,	Africa for results initiative, the African Capacity Building Foundation, Harare, Zimbabwe.
	7	Gbedomon, Rodrigue Castro	Opportunités d'affaires pour les jeunes au sein des chaines de valeur agricoles	Centre d'Actions pour l'Environnement et le Developpement Durable

Appendix 1.11. Participation to workshops/conferences in 2017

N°	Title and period	Type of presentation	Country	Name of the participants from LABEF
1	South Africa Science Forum (7-8 December 2017)	Participant	Pretoria, South Africa)	Dr. Valère SALAKO
2	AfCoP Natural Resources Management for Results Meeting, 27-29 April 2017	Panelist	Arusha, Tanzania	Dr. Rodrigue Castro Gbedomon
3	European Conference of Tropical Ecology (6-10 February 2017)	Poster	Vrije Universiteit Brussels, Belgium	Dr. Thierry HOUEHANOU
4	Montpellier Omics Days (6-7 February 2017)	Participant	Montpellier, France	MSc Eldys B. AMOUSSOU
5	6th Symposium of Science, Cultures and Technology (September 2017)	Oral presenter	Abomey Calavi, Benin)	Dr Epiphane SODJINOU
6	6th Colloquium of Sciences, Technologies and Cultures of University of Abomey-Calavi, (25-30 September 2017)	Oral presentation	Benin	MSc Kisito GANDJI
7	African Doctoral Academy Winter School 2017, 26 June-7th July 2017	Oral presentation	South Africa	MSc Kisito GANDJI

Appendix 1.12. Research projects of LABEF in 2017

N°	Title	Funding	Objectives	Period
1	Restauration, conservation et gestion durable des zones humides côtières du Costa Rica face au changement climatique (COSTA RICA, BENIN)	Fond Français pour l'environnement Mondiale	Le projet vise à développer la restauration, la conservation et la gestion communautaire durable des zones humides côtières (notamment les mangroves) du Costa Rica, contribuant à l'atténuation et l'adaptation au changement climatique, à travers le renforcement de	2018-2022

N°	Title	Funding	Objectives	Period
			politiques publiques et la mise en œuvre d'actions de terrain qui associent les communautés locales, avec l'objectif de se répliquer au niveau international en un projet pilote au Bénin.	
2	Scaling up African baobab food products valuation through enhancement of their safety and value chains for food and nutritional security in Benin (West-Africa)	RUFORUM	this project aims to develop a sustainable and competitive baobab VC in Benin. The project is built around six work-packages and will facilitate university-TVET and community linkages to upgrade baobab products VC while contributing to improve farmers' livelihoods and baobab conservation.	2018-2021
3	Vers une gestion durable des mangroves au Bénin : dynamique spatio-temporelle, biodiversité, usages et gestion locale, capacité de séquestration de carbone et impacts des changements climatiques.	FNRSIT	(i) caractériser la dynamique spatio-temporelle des mangroves du Bénin ; (ii) estimer la biodiversité des mangroves du Bénin ; (iii) évaluer les usages des mangroves ainsi que les pratiques locales de gestion des mangroves ; (iv) évaluer la capacité de séquestration de carbone et l'effet des changements climatiques sur l'étendue des mangroves du Bénin	2017-2019
4	Setting up a system of evaluation of the land use dynamics and follow up indicators of the transboundry biosphere reserve of the Mono	Observation spatiale des forêts d'Afrique Centrale et de l'Ouest/IRD	Le projet vise donc à développer des méthodes rentables, respectueuses de l'environnement et permettant la production durable de feuilles de baobab pour assurer la sécurité alimentaire des petits producteurs dans les trois zones climatiques en république du Bénin.	2017-2019
5	Enhancing nutritious food availability through promotion of native edible tree/shrub species in Sub-Saharan Africa	Agropolis Fondation – Fondazione Cariplo and Fondation Daniel et Nina Carasso	The project aims at supporting so-called farmer-led innovation platforms in improving collection, production, processing and marketing of products from edible tree/shrub species, whereas field schools will be established to disseminate technologies.	2017-2019
6	Improving the efficiency of conservation and management strategies of the threatened tree species, *Afzelia africana* Sm. using morphological and molecular tools on its West African populations	Georg Forster Research Fellowship (HERMES)	(i) assess morphological variation of *A. africana* among populations of different climatic zones and disturbance degrees in West Africa; (ii) assess the genetic diversity and structure of populations of *A. africana* sampled from different disturbance degrees and different climatic zones on a latitudinal gradient; (iii) evaluate hypothetic gene pools sharing the morphological groups; (iv) describe the mating system and patterns of gene dispersal of various populations	
7	Biologie de la Conservation et Ethnopharmacologie des Ligneux médicinaux de la pharmacopée béninoise (BIOCEL)	FNRSIT	(i) Evaluer la diversité et la disponibilité des principales espèces ligneuses médicinales employées pour le traitement des maladies humaines et animales les plus récurrentes ; (ii) Déterminer les aires prioritaires de conservation des principales espèces ligneuses médicinales ; (iii) Evaluer *in vivo* les propriétés médicinales des principales espèces ligneuses utilisées pour le traitement des pathologies animales la plus récurrente.	
8	Assessing the effects of abiotic and biotic factors on the early recruitment of the threatened *Afzelia africana* Sm. ex Pers. (Fabaceae-Ceasalpinioideae) in Benin (West Africa)		To study the effects of abiotic and biotic factors in the early recruitment of the threatened *A. africana* Sm. in the Pendjari biosphere reserve	

N°	Title	Funding	Objectives	Period
9	Identifying suitable ecotypes for Agroforestry Fruit Trees for future climates	The Alexander von Humboldt Foundation	(i) Comparing inter-annual variation in plastic traits among different ecotypes of three key AFT species; (ii) Examining how ecotype-specific plasticity could affect species distributions under current and future environments, using different demographic indicators; (iii) Modeling and mapping current and future potential range of different ecotypes of three key AFT species. (iv) combining results from different plasticity indicators to derive more plausible predictions.	
10	Promoting environmentally friendly practices for sustainable baobab leaves production for food and nutritional security in smallholders farming systems in Benin	RUFORUM	Develop a set of agro-ecological practices to improve the production of the daily used baobab leaves by building capacity of local farmers and NGOs on how to propagate and grow baobab treelets in small garden plots using environmentally friendly practices	2015-2017
11	Project SCOPA (Sustainability of Cotton Production in Africa)	DANIDA	The overall aim of the project is to increase knowledge about the sustainability of cotton production in SSA, where we will particularly focus on organic cotton production.	2015-2018

Appendix 1. 13 Research Grants in 2017

N°	Title of Grant	Beneficiaries	Status
1	International Foundation for Science (IFS) Individual Research Grant	Ahuéfa M. Kegbe	Ongoing
2	International Foundation for Science (IFS) Individual Research Grant	Frederic Tovissode	Ongoing
3	Centre d'Excellence Africain en Sciences Mathématiques et Applications (CEA-SMA)	Bruno Lokonon	Ongoing
4	The Regional Universities Forum for Capacity Building in Agriculture (RUFORMUM)	Guillaume Hounsou-Dindin	Completed
5	The Regional Universities Forum for Capacity Building in Agriculture (RUFORMUM)	Nadejda Sero	Completed
6	Rufford second Grants	Merveille Koissi Savi	Ongoing
7	International Foundation for Science (IFS) Individual Research Grant	Honfo Sèwanou Hermann	Ongoing
8	International Tropical Timber Organization	Dr. Valère SALAKO	Ongoing
9	Sud Expert Plantes Développement Durable (SEP2D) research grant	Dr. Valère. SALAKO	Ongoing
10	Rufford Grant	Dr. Charlemagne GBEMAVO	Ongoing
11	Campus France/ Ambasssade de france au Benin	AMOUSSOU B. Eldys	Ongoing
12	Consolidoc	Mensah Sylvanus	Completed
13	International Foundation for Science (IFS) Individual Research Grant	Zanvo Serge	Ongoing

Appendix 1.14. Prizes and nomination in 2017

N°	Titre du prix et/ou de la distinction	Grantees
1	Young affiliates of the African Academy of Sciences	Dr.Ir. Rodrigue Idohou
2	The 2017 Young affiliate World Academy of Sciences Regional Office for sub-Saharan Africa (TWAS ROSSA)	Dr. Ir. Salako Valère
3	Nominated among the 2017 best African scientists	Prof. Dr. Ir. Achille E. Assogbadjo
4	Full Professor in Forestry (CAMES)	Prof. Dr. Ir. Achille E. Assogbadjo
5	Nomination as AGNES member of trustees 2017 (Pr Romain GLELE KAKAÏ	Prof. Dr. Ir. Romain GLELE KAKAÏ

Appendix 1.15. List of interns/trainees received in 2017

	Full name	Highest degree	Institution of origin	Country
1	OBOGNON Noel	DEA	Faculty of Agronomic Sciences, University of Abomey-Calavi	Benin
2	AGBO A. Rolex Aurel	Bsc	National University of Agriculture	Benin
3	YOLOU K. Laetitia	Bsc	National University of Agriculture	Benin
4	BONI S. Guy Landry	Bsc	Faculty of Agronomic Sciences, University of Abomey-Calavi	Benin
5	VODOUNNON M. Eric José	Bsc	Polytechnic School of Abomey-Calavi, University of Abomey-Calavi	Benin
6	HOUNTON Sagbo Anicet	MSc	University of Ibadan, Nigeria	Benin
7	ALLAGBE Freddy	MSc	Faculty of Agronomic Sciences, University of Abomey-Calavi	Benin
8	KPODO Esther	Bsc	National University of Agriculture	Benin
9	BEHANZIN Habib	Bsc	Faculty of Agronomic Sciences, University of Abomey-Calavi	Benin
10	GOGAN Yannick	Bsc	Faculty of Art, Letters and Humanities Sciences, University of Abomey-Calavi	Benin
11	ZINSOU Augustin	Bsc	Ecole Nationale Supérieure d'Aménagement et de Gestion des Aires Protégées, University of Parakou	Benin
12	ISSIFOU Rassadi	Bsc	Ecole Nationale Supérieure d'Aménagement et de Gestion des Aires Protégées, University of Parakou	Benin
13	TOBOCHIANDOU Axel	Bsc	University of Parakou	Benin
14	M. Lankoandé H Benjamin	Dr	Université de Fada N'Courma	Burkina Faso
15	Ghafi KONDI AKARA	PhD Student	African Center of Excellence, Felix Houphouet-Boigny University (ACE-CCBAB_UFHB), Côte d'Ivoire	Cote d'Ivoire

Appendix 2: Abstracts of the publications in LABEF in 2017

1. Habitats and utilizations of *Lippia multiflora* moldenke: Local perception of four ethnic groups from Benin (West Africa)

Atanasso, J. A.[1], Chadare, F.J.[4], Padonou, E.A.[1,3], Ahouansinkpo, E.[1], Koura[1], K., T. Houehanou, T., Assogbadjo, A.E.1*, Glèlè Kakaï, R. and Sinsin, B.

[1]Laboratory of Apply Ecology Sciences, Faculty of Agronomic Sciences, University of Abomey-Calavi, Benin; [2]Ecole des Sciences et Techniques de Conservation et de Transformation des Produits Agricoles, Université Nationale d'Agriculture, Benin ; [3]School of Forestry and Wood Ingeniery, National University of Agriculture, Benin ; [4]Laboratoire de Science des Aliments, Faculté des Sciences Agronomiques, Université d'Abomey-Calavi, Benin ; [5]Faculty of Agronomic Sciences, University of Abomey-Calavi, Laboratory of Biomathematics and Forest Estimation, Benin

Agronomie Africaine, https://www.ajol.info/index.php/aga/article/view/164502

Abstract

The purpose of this study is to assess the local knowledge on the habitats and uses of *Lippia multiflora* in Benin. A total of 180 households distributed in four ethnic groups in the Sudano-Guinean (Mahi, Bariba and Peulh) and the Sudanian zones (Boo and Peulh) in Benin were surveyed. The perception of the local population on the habitats and use of the species was assessed. Pearson Chi-square Test was used to test the independency of the use of the species according to the ethnic groups. Correspondence Analysis was used to assess the relationship between the organs used and the ethnic groups. Results revealed that *L. multiflora* was mentioned abundant in fallow and savanna. The use value of the species was 0.65 for food, 0.50 for medicine versus 0.03 for handicraft. Mahi ethnic group used mainly the leaves of the plant species for health care, while Boo and Peulh used mainly the inflorescences as food (sauce, soup and tea). Bariba ethnic group used the stems for handicraft. Diseases treated by the species were stomach ache, fever, malaria, toothache, high blood pressure, wound, physical weakness of baby, itch, reduced lactation activity after birth and diverse attacks. Valorization programs can then be based on those utilizations according to ethnic groups in Benin.

Key words : *Lippia multiflora*, local knowledge, food and medicinal uses, biogeographic zones in Benin, ethnic groups

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2. Monte Carlo Simulations for Assessing the Performance of Permutation of Residuals Methods in One-way ANOVA.

Savi, M. K.[1], Dossou-Yovo, E. R.[2], & Kakaï, R. G[1].

[1]Laboratoire de Biomathématiques et d'Estimations Forestières (LABEF), Faculté des Sciences Agronomiques, Université d'Abomey-Calavi, [2]Africa Rice Center, Benin

Turkiye Klinikleri Journal of Biostatistics

http://www.turkiyeklinikleri.com/article/en-monte-carlo-simulations-for-assessing-the-performance-of-permutation-of-residuals-methods-in-one-way-anova-80680.html

Abstract

The current paper aims to assess the relative performance of three permutation methods of residuals where exact probability was used. Material and Methods: A total of 198 Monte Carlo simulations were run for the three permutation of residuals considering different population distributions, increasing sample size and variance under the unique scenario of balanced and homoscedastic design in ANOVA framework. Results: When residuals follow a lognormal distribution, permutation of residuals under reduced model showed the best performance. In the case of cubed exponential distribution, permutation of residuals under full model revealed satisfactory results. Permutation of residuals under modified model revealed a conservative character. Conclusion: The use of the exact probability instead of the approximate value has changed the behaviour of the permutation of residuals in the case of one-way ANOVA. We suggest that the choice of the permutation method in one-way ANOVA should be based on the distribution of the residuals.

Keywords: Permutation test; ANOVA; exact probability; alpha rate; power of test; sample size

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3. Plants in traditional home gardens: richness, composition, conservation and implications for native biodiversity in Benin

Gbedomon, R.C.[1], Salako, V.K.[1], Adomou, A.C.[2], Kakaï, R.G., & Assogbadjo, A.E.[3]

[1]*Laboratoire de Biomathématiques d'Estimations Forestières, Université d'Abomey-Calavi, Benin ;* [2]*Departement de Biologie végétale, Faculté des Sciences et Techniques, Université d'Abomey-Calavi, Benin;* [3]*Laboratoire d'Ecologie Appliquée, Université d'Abomey-Calavi, Benin*

Biodiversity and Conservation ; https://link.springer.com/article/10.1007/s10531-017-1407-8

Abstract

Home gardens have received increasing attention and have been insistently presented as hotspots for agro-biodiversity over the last decades. However, apart from their exceptional high plant species diversity, there is little quantitative evidence of the effectiveness of plant species conservation in home gardens. This study examined this issue by assessing (i) the size and membership of garden flora and the contribution to the maintenance of the national flora, (ii) how home garden flora connects to the larger ecosystem it belongs to and (iii) the conservation status of plant species at the home garden level. 360 home gardens distributed in three agro-ecological zones and nine phyto-geographical districts in Benin were visited and inventoried. Diversity parameters at different taxonomic levels were calculated. Species accumulation and spatial occupancy, multivariate methods and rarity index were also used for data analysis. Findings showed that the 360 studied home gardens hosted up to 14.21% of plant species and 44.32% of plant families of the national flora. Home garden flora was constantly dominated by exotic plant species but strongly connected to their surrounding ecosystems, being composed of at least 60% of plant species from their phyto-geographical districts. Finally, Home garden plant species were mostly rare and threatened at the home garden level. In this study, we acknowledge the contribution of home gardens to the maintenance of plant

species diversity at regional and global levels than local level. Based on the observed prevalence of exotic species, HG effectiveness in sustainably conserving native plant species biodiversity remains questionable.

Keywords: Agro-biodiversity Flora Native species Exotic species Conservation Benin

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4. Pilot assessment of locally acknowledged morphotypes of *Irvingia gabonensis* (Aubry-Lecomte) Baill. in southwestern Benin (West Africa).

E.A. Padonou[1,2], F.C. Tovissodé[3], R. Idohou[3], V.K. Salako[3], L. Fantondji[4], R. Vihotogbé[1,2,3], B. Fandohan[1,2,3] and A.E. Assogbadjo[2]

1Ecole de Foresterie et Ingénierie du Bois, Université Nationale d'Agriculture, Benin
2Laboratoire d'Ecologie Appliquée, Faculté des Sciences Agronomiques, Université d'Abomey-Calavi, Benin ; 3Laboratoire de Biomathématiques et d'Estimations Forestières, Faculté des Sciences Agronomiques, Université d'Abomey-Calavi, Bénin ; 4Direction Générale des Forêts et Ressources Naturelles, Benin

Fruits; http://www.pubhort.org/fruits/72/5/6/index.htm

Abstract

This study was set up to assess the local perception on morphological differentiation within sweet African bush mango tree (*Irvingia gabonensis*) in southwestern Benin. Materials and methods – Locally acknowledged morphotypes (LAM) and local differentiation criteria were determined, using group discussions with 60 farmers. A total of 120 trees distributed between the fixed LAM were randomly sampled with farmers' aid. The trees were morphologically characterized based on their leaves (length and width), fruit (length, diameter and mass), seeds (length, diameter and mass), kernels (mass) and fruit flesh (mass and depth). The owners of the 120 trees were questioned for their LAM preference, number of owned LAM trees, propagation methods, and taboos. Data were analyzed through a multivariate analysis of variance (MANOVA). Results and discussion – Three LAM were differentiated: (1) a pasty morphotype named 'woto', (2) an aqueous morphotype named 'shito', and (3) an intermediate morphotype. The MANOVA revealed that contrary to farmers' perceptions, the accurate prediction of LAM on the field was hard ($P > 0.05$). However, canonical discriminant analysis indicated an overall significant morphological difference between the three LAM ($P < 0.001$). Although farmers preferred pasty and intermediate LAM, the aqueous LAM was most abundantly found on farms. Twelve taboos and their potential negative impacts were unanimously recognized in the context of *I. gabonensis* management. Most farmers admitted to have already broken these taboos, particularly the taboo prohibiting plantation of the species. Conclusion – This study highlights an ongoing but stagnating local domestication process for this species. A progressive breaking of non-profitable taboos appears to be a gate for a guided selection process.

Keywords: Benin, African bush mango tree, *Irvingia gabonensis*, agroforestry system, plant domestication, local perception

5. Effect of short term agroforestry systems on soil quality in marginal coconut lands in Sri Lanka

A.A.A.J Atapattu[1]*, S.H.S Senarathne[1], S.A.S.T Raveendra[1], W.C.P Egodawatte[2] and S Mensah[3]

[1]*Agronomy Division, Coconut Research Institute, Sri Lanka ;* [2]*Department of Plant Sciences, Rajarata University of Sri Lanka, Sri Lanka ;* [3]*Laboratory of Biomathematics and Forest Estimation, University of Abomey-Calavi, Benin*

Agricultural Research Journal ;
http://www.indianjournals.com/ijor.aspx?target=ijor:jre&volume=54&issue=3&article=004

Abstract

A study was conducted to assess the potential of using coconut-based agroforestry systems to improve soil quality of marginal coconut lands and to screen out the effective perennial forest species in revitalizing the soil properties in intermediate of Sri Lanka. Experiments were conducted on Andigama soils in Rathmalagara estate of Sri Lanka to assess the influence of short rotation forestry-based agroforestry production systems on the soil properties at marginal upland condition using eight forest plant species (*Acacia auriculiformis, Calophyllum elatum, Macaranga paltata, Acacia mangium, Gliricidia sepium, Swietenia macrohylla, Bridelia moonii and Tectonia grandis*). The highest value of soil organic matter (SOM) was observed in G. sepium planted plots (1.86 %) followed by *A. mangium* (1.69 %), while the lowest value was obtained for control plots (0.21 %). Plots with N-fixing tree species had 30-50 % higher total nitrogen concentration in the 0-40 cm soil than plots with non-N-fixing tree species. The highest value of total nitrogen (TN) was observed in A. auriculiformis plots (1.48 mg kg-1) while the lowest was recorded in control plots (0.92 mg kg-1). Exchangeable potassium was significantly higher in G. sepium planted plots (0.48 cmol kg-1) as compared to other plots. The highest microbial activity (128.5 CO2 µg g-1 soil day-1) was observed in A. auriculiformis plots, followed by *M. paltata* (102 CO2 µg g-1 soil day-1), while the lowest activity was recorded in the control plots (65.56 CO2 µg g-1 soil day-1). Significantly higher microbiological activities confirmed the symbiotic association of the studied tree species with soil microbes. These findings provide preliminary evidence on the effectiveness of A. auriculiformis and G. sepium in revitalizing the soil properties of degraded coconut lands using short term agroforestry.

Key words: Agroforestry systems, Coconut lands, Forest plant species, Soil organic matter, Soil quality

6. Structural and spatial patterns of Isoberlinia species in a disturbed community forest (Benin, West Africa).

Goussanou, C. A.[1], Tente, B. A.[1], Akouehou[3], G., Salako, V. K.[4], Glèlè-Kakaï, R. L.[4], & Sinsin, B. A.[1]

[1]*Laboratory of Applied Ecology, University of Abomey-Calavi, Benin;* [2]*Laboratoire de Biogéographie et d'Expertise Environnementale, University of Abomey-Calavi, Benin ;* [3]*Centre d'Etudes, de Recherche et de Formation Forestières, Benin ;* [4]*Laboratoire de Biomathématiques et d'Estimation Forestières, Benin.*

Kastamonu Üniversitesi Orman Fakültesi Dergisi

http://dergipark.gov.tr/kastorman/issue/31244/340150

Abstract

Aim of study: This study focused on the analysis of structural and spatial patterns of *Isoberlinia spp* stands according to topographic units. Area of study: Data collection were carried out within the Zouzounkan forest reserve, located in Southern Benin.

Material and Methods: Square plots of 1 ha were considered for the forest inventory in which, geographical coordinates of Isoberlinia individuals were recorded. Ripley's K function was used to assess the spatial patterns of the species in the forest whereas dendrometric and ecological parameters was computed to analyze the structure of the species populations. Possible impact of topographic units of the forest reserve on dendrometric and spatial patterns of trees was assessed.

Main results: The results show that *Isoberlinia spp*. is more abundant on the hill side than on the top and down hills. Aggregative spatial distribution of trees was found across topographic units with more aggregation on the hill side. However beyond a radius of 8 m aggregation decreased. Furthermore, significant difference was noted on dendrometric patterns of Isoberlinia trees according to topographic unit.

Research highlights: Results obtained suggest that effective conservation strategy of Isoberlinia trees in Zouzoukan forest reserve should take into account topographical patterns.

Keywords: Structural and spatial pattern, Topography, *Isoberlinia spp*, Zouzounkan forest reserve, Benin Republic.

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7. Impacts of the conventional tillage tools and reduced tillage on the soil fertility preservation: critical review.

Dayou E. D.[1] *, Zokpodo K. L. B.[1], Glèlè Kakaï A. L. R.[2], Ganglo C. J.[1]

[1]School of Environmental Management, Faculty of Agronomic Sciences, University of Abomey-Calavi, Benin; [2]Laboratory of Biomathematics and Forestry Estimations, Faculty of Agronomic Sciences, University of Abomey-Calavi, Benin

Journal of Applied Biosciences

https://www.ajol.info/index.php/jab/article/view/163475

Abstract

Objective: The long-term impacts of conventional tillage through compaction, soil erosion and loss of soil fertility have led to evaluation of this system. To mitigate these problems, simplified cultivation techniques (SCT) are increasingly practiced. The objective of this review is to clarify the effects of conventional tillage and minimum tillage on soil fertility.

Methodology and Results: The methodology is based on a documentary research through a synthesis and a confrontation of the researches results of different authors. It is found that, after 5 to 6 years, conventional tillage lowers the fertility of the soil and reduces its productivity. There is a diversity of SCT with convincing results. These techniques leave more agricultural residues and allow an improvement of the indicator of organic matter on the soil by reduction of the mineralization. The STC, such as zero tillage, increase soil fertility and have the potential to reduce greenhouse gas emissions. Improving soil fertility

increases yield with a saving in working time. Hydraulic conductivity increases when switching from conventional tillage to direct sowing. Compared to conventional tillage, SCT provide an ideal environment for soil fertility recovery. However, the adoption of SCT and no-till is subject to a constraint on the agricultural equipment used. The design of effective equipment remains the challenge to facilitate large-scale application of SCT.

Conclusion and application of results: It is noticed that conventional tillage induce long-term disturbance of soil properties and reduce fertility. Simplified cultivation techniques and particularly a direct sowing have a positive effect on the amount of soil organic matter, its density and water retention, and final production. The specific direct seeder must be designed to accompany the mechanization of these techniques.

Keywords: conventional tillage, direct sowing, soil fertility, conservation agriculture.

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8. Fragmentation of Forest Ecosystems and Connectivity Between Sacred Groves and Forest Reserves in Southeastern Benin, West Africa

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Tropical Conservation Science
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Abstract

An old yet appealing fact in conservation biology is the potential of sacred groves (SGs) and forest reserves (FRs) to harbor considerable biodiversity. Although fragmentation effects have been extensively investigated in several studies, the specific context pertaining to SG has rarely been discussed. Using data from two sites (Kétou and Pobe`) in South Benin, we studied the similarities and connectivity between SG and FR, and the effects of fragmentation on forest ecosystems. Nonmetric multidimensional scaling and Moran index-based correlogram were used to analyze species-based similarities, distribution, and spatial autocorrelation. Fragmentation effects on characteristic species and forest structures were also tested. Results showed slightly greater similarity between SG and FR for Kétou SG–FR group compared with that of Pobe`. Spatial association between SG and FR was also site specific and stronger in Pobe` SG–FR group. The weak spatial dependence between SG and FR for the Kétou group reflects the state of degradation in the FR. Species richness and structural parameters were higher in SG than in FR for both sites. The results indicate that these forests emanated from fragmentation of primary forests and that the fragmentation effects were more pronounced in FR. The indicator species analysis further revealed some fragmentation effects on woody species composition, suggesting that forest isolation is potential threat for conservation of biological and structural diversity. In sum, this study shows that despite their limited spatial extent, SGs are key landscape features that play a vital role in local biodiversity conservation.

Keywords: sacred groves, fragmentation, landscape connectivity, forest reserves, Guineo-Congolese

9. Effet du pourghère (*Jatropha curcas* l.) Sur la performance agronomique du maïs (*Zea mays* l.) Et du manioc (*manihot esculenta* crantz) et sur la fertilité du sol au sud-bénin

De souza, J. F.[1], Gbemavo, D. S. J. C.[2], Gnangle, P. C.1, Azontonde, A.[1], Chabi adjobo, M. A.[2], Behingan, M. B.[3], and Glele Kakaï, R.[2]

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Annales des sciences agronomiques

Abstract

La présente étude a été effectuée afin d'évaluer l'influence de *J. curcas* sur la performance agronomique de deux cultures associées (maïs et manioc) et sur la fertilité du sol dans un système agroforestier. L'essai a été conduit dans les agrosystèmes Jatropha-culture et cultures associées pures à Ouinhi. Les données collectées ont concerné d'une part les caractéristiques morphologiques des cultures associées et leur rendement, et d'autre part le nombre de turricules de vers dans les sols des différents agrosystèmes. Des prélèvements d'échantillons de sols ont été aussi faits et soumis à des analyses qui ont porté sur le pHeau, les teneurs en carbone, azote et matière organique. Des modèles linéaires à effets mixtes ont été exécutés afin d'apprécier l'effet du système de culture sur les paramètres de croissance des cultures et ceux biologiques du sol. Il ressort de nos résultats que le poids moyen des épis de maïs et de manioc a varié significativement suivant le système de culture (Prob < 0,05) ; *J. curcas* impacte positivement le rendement du maïs et affecte négativement celui du manioc. Le nombre de turricules de vers de terre a varié aussi significativement dans le temps et d'un système de culture à l'autre (Prob = 0,000) ; il est plus élevé dans les systèmes de culture à Jatropha. Pour les paramètres physico-chimiques, les variations observées dans les profils d'un système à l'autre n'étaient pas significatives. Toutefois les taux de matière organique ont tendance à être plus élevés dans les systèmes de culture à *Jatropha curcas*. Les systèmes à base de Jatropha-Manioc sont déconseillés toutefois d'autres systèmes de production qui incluent le Jatropha sont conseillés pour une amélioration de l'activité biologique du sol.

Mots clés : *Jatropha curcas* L., micronutriments du sol, agrosystème, cultures vivrières, Ouinhi

10. Functional diversity of home gardens and their agrobiodiversity conservation benefits in Benin, West Africa

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Journal of ethnobiology and ethnomedicine
https://ethnobiomed.biomedcentral.com/articles/10.1186/s13002-017-0192-5

Abstract

Background: Understanding the functional diversity of home gardens and their socio-ecological determinants is essential for mainstreaming these agroforestry practices into agrobiodiversity conservation strategies. This paper analyzed functional diversity of home gardens, identified the socio-ecological drivers of functions assigned to them, and assessed the agrobiodiversity benefits of home gardens functions.
Methods: Using data on occurring species in home garden (HG) and functions assigned to each species by the gardeners, the study combined clustering and discriminant canonical analyses to explore the functional diversity of 360 home gardens in Benin, West Africa. Next, multinomial logistic models and chi-square tests were used to analyze the effect of socio-demographic characteristics of gardeners (age, gender, and education level), agroecological zones (humid, sub-humid, and semi-arid), and management regime (single and multiple managers) on the possession of a functional type of home gardens. Generalized linear models were used to assess the effect of the functions of home gardens and the determinant factor on their potential in conserving agrobiodiversity.
Results: Seven functional groups of home gardens, four with specific functions (food, medicinal, or both food and medicinal) and three with multiple functions (more than two main functions), were found. Women owned most of home gardens with primarily food plant production purpose while men owned most of home gardens with primarily medicinal plant production purposes. Finding also showed that multifunctional home gardens had higher plant species diversity. Specifically, crops and crop wild relatives occurred mainly in home gardens with food function while wild plant species were mostly found in home gardens with mainly medicinal function.
Conclusions: Home gardening is driven by functions beyond food production. These functions are mostly related to direct and extractive values of home gardens. Functions of home gardens were gendered, with women mostly involved in home food gardens, and contribute to maintenance of crops and crop wild relatives while men were mostly home medicinal gardeners and contribute to the maintenance of wild plant species in home gardens. Although multiple functional home gardens were related to higher plant diversity, there was no guarantee for long-term maintenance of plant species in home gardens.

Keywords: Function, Home gardens, Agrobiodiversity, Clustering, Crop wild relatives, Crops, Wild plant species, Republic of Benin

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11. Leaf biomass modeling, carrying capacity and species-specific performance in aerial fodder production of three priority browse species *Afzelia africana, Pterocarpus erinaceus* and *Daniellia oliveri* in Benin.

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Livestock Research for Rural Development, https://goo.gl/Q6K2FG

Abstract

Browse plants play an important role in feeding ruminants especially in dry seasons when herbaceous forage is unavailable. This paper aim at developing models for leaf biomass estimating for their rapid evaluation and the planning of the rational use conditions. For each of the three main browse species, 25 trees were sampled. Dendrometric measurements such as girth at breast height, total height, stem height, crown diameter and crown height were performed on each tree before harvesting the entire leaf biomass which is then weighed. A sample of 200 g of leaves was taken per tree to estimate the dry matter. Kruskal-Wallis test was performed to compare plant traits among the three species. Relationship between plant traits and aerial fodder biomass was examined using a stepwise multiple regression. Carrying capacity was determined for the dry season in the study area. Aerial fodder production varied among species. The best models that estimated leaf biomass production of *Afzelia africana* and *Pterocarpus erinaceus* were obtained with diameter at breast height, a plant trait not directly affected by pruning as predictor. For *Daniellia oliveri* the best model uses the crown height as estimator parameter. Globally, the carrying capacity of each species is about 0.05 to 0.09 TLU/ha/year for *Afzelia africana*; 0.03 to 0.08 TLU/ha/year for *Pterocarpus erinaceus* and 0.04 to 0.79 TLU/ha/year for *Daniellia oliveri* in the dry season. The number of animal that can sustainably be fed in the study area was 38497. The introduction of these fodder tree species in afforestation/reforestation activities can improve the availability of leaf biomass to feed animals.

Keywords: carrying capacity, fodder, models, pastoralism, production

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12. Use diversity and farmer's preference of 48 local multipurpose fodder trees: a comparative analysis of three sociolinguistic groups of Benin

Sèwadé, C.[1], Lokonon, B.E.[2], Azihou, A.F.[1], Akouèhou, G.S.[3], Mensah, G.A.[4], Glèlè Kakaï, R.[2], & Houinato, M.R.B.[1]

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Annales des sciences agronomiques

Abstract

Native plant species in general and fodder trees in particular contribute significantly to the daily needs of both human and animal especially in developing countries. However, these important species are often neglected leading to the erosion of their diversity and usefulness. This study aimed to (i) quantify the impact of age, gender and ethnicity on the use and perceived value of local woody fodder species; (ii) identify the most important and preferred woody fodder species across sociolinguistic groups and (iii) identify the overharvested and underutilized woody fodder species across sociolinguistic groups. A total of 220 informants belonging to three sociolinguistic groups (Bariba, Nago and Peulh) were interviewed through a semi-structured survey on the fodder trees that they use for different purposes. The most cultural important fodder species ranked by the local people were determined for each sociolinguistic group. The

species were categorized into six use categories by the informants: food, medicine, construction, fuel, veterinary and fodder. Afzelia africana, Khaya senegalensis and *Pterocarpus erinaceus* are the most widely used species by Peulhs and Bariba to feed animals, while for the Nagos, *Mangifera indica* comes first followed by *Ficus umbellata, Ficus platyphylla* and *Pterocarpus erinaceus*. Combining the different use categories, overharvested or underutilized species depend on the sociolinguistic group. But globally, *A. africana, K. senegalensis, P. erinaceus* and *Mangifera indica* are overharvested species whereas *Ficus sycomorus*, *Combretum micranthum, Combretum molle, Balanites aegyptiaca, Crossopteryx febrifuga, Sarcocephalus latifolius*, are underutilized species. For a sustainable management of pasture lands, it is suggested (i) an assessment of the availability of the overexploited species in the study area; (ii) their use in restoration, afforestation/reforestation and plantation activities.

Keywords : Biodiversity, Fodder trees, Local knowledge, Sociolinguistic group, Use.

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13. Usages traditionnels et valeur économique de *Synsepalum dulcifcum* au Sud-Bénin

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Bois et Forêts des Tropiques
http://revues.cirad.fr/index.php/BFT/article/view/ID-BFT-161017

Abstract

Synsepalum dulcificum (Schumach. & Thonn. Daniell) est un arbuste originaire de l'Afrique de l'Ouest, inscrit sur la liste des espèces vulnérables de l'UICN. Au Bénin, son importance pour les populations locales reste peu documentée. L'étude avait pour objectif d'évaluer les connaissances endogènes, la valeur d'usage et l'importance économique de l'espèce pour les populations locales. Des enquêtes ethnobotaniques et économiques ont été conduites auprès de 606 personnes réparties dans 13 groupes socioculturels du Sud-Bénin. Des paramètres ethnobotaniques (fréquence de citation, valeur d'usage ethnobotanique) et économique (revenu moyen réalisé) ont été calculés, et leur significativité éprouvée par l'ajustement de modèles linéaires généralisés et le test de Kruskal et Wallis. Les résultats ont montré que *S. dulcificum* était bien connu des populations locales du Sud-Bénin (100 % des enquêtés), qui le cultivaient notamment dans les jardins de case. Toutes les parties de la plante étaient utilisées à des fins médicinales, alimentaires et spirituelles. Les connaissances et la valeur d'usage de la plante variaient entre les groupes socioculturels du Sud-Bénin, avec un gradient décroissant Est-Ouest. Les connaissances et la valeur d'usage variaient suivant le sexe, l'âge et le domaine d'activité, les connaissances étant concentrées au niveau des hommes, des adultes et personnes âgées, et des praticiens de la médecine traditionnelle. L'évaluation économique a révélé un circuit de commercialisation relativement court. Le faible revenu moyen réalisé sur la vente des fruits

(environ 28 USD par an et par commerçant) illustre la faible valeur économique de l'espèce qui constitue une ressource de subsistance en déclin. La conservation et la valorisation optimale de l'espèce nécessiteront des investigations sur les plans nutritionnel, phytochimique et pharmaceutique, phénologique, morphologique et génétique, le développement d'une sylviculture, l'intégration de la plante dans les politiques formelles de conservation, et enfin le développement d'une chaîne de valeurs à travers la mise en place d'une véritable filière.

Mots-clés : *Synsepalum dulcificum*, baie miraculeuse, enquête ethnobotanique, groupe socioculturel, phytothérapie, valeur d'usage, République du Bénin.

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14. A quantitative ethnobotanical approach toward biodiversity conservation of useful woody species in Wari-Maro forest reserve (Benin, West Africa)

Ahoyo, C. C.[1], Houehanou, T. D.[1,2,3,5], Yaoitcha, A. S.[1,4], Prinz, K.[5], Assogbadjo, A. E.[1], Adjahossou, C. S.[1] & Houinato, M. R.[1]

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Environment, Development and Sustainability
https://link.springer.com/article/10.1007/s10668-017-9990-0

Abstract

Quantitative ethnobotany researches can contribute much to guide biodiversity conservation, especially in developing countries. Our study presents a step-by-step approach to identify priority species for local conservation of useful woody species. The presented approach includes (1) an investigation of the popularity and versatility of woody species in the local people, (2) an estimation of the ecological availability of useful tree species in the forest and (3) identification of local priority species for conservation. We focused the study on the Wari-Maro forest reserve in the Sudanian zone of Benin as an example to implement such approach and identify useful priority species for sustainable conservation and management strategies development. Ethnobotanical surveys were conducted with people in surrounding villages of the forest composed by different sociocultural groups. Floristic vegetation surveys were performed within the forest to assess the local ecological availability of used woody species. A principal component analysis was performed to analyze the versatility, the popularity and the ecological availability of species. Spearman's correlation test was used to assess relation between variables. In total, 79 woody species were reported for seven main types of uses: technology, construction, medicinal, veterinary, food, forage and energy. Among them, 35 were most popular and versatile, and 3 were characterized as priorities for conservation especially regarding their less availability and more versatility. We discussed the used approach by the underlining importance of integrating wood uses or multiples uses in conservation priorities setting and conservation decision-making of useful woody tree species.

Keywords : Versatility, Ecological availability, Quantitative ethnobotany, Conservation priorities

15. Patterns of elephant utilization of *Borassus aethiopum* Mart. and its stand structure in the Pendjari National Park, Benin, West Africa

Salako, V.K.[1], Houéhanou, T.T.[1,2,3]., Yessoufou, K.[4], Assogbadjo, A.E.[1,2], Akoègninou, A.[5] & Glèlè Kakaï R.[1]

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Tropical Ecology, https://goo.gl/c55tov

Abstract

Understanding interactions of elephants with threatened plant species is crucial to guide conservation decisions in protected areas (PAs). This study focused on the dioecious palm *Borassus aethiopum* Mart. in the Pendjari National Park (PNP). The aim was to assess elephant damages to the palm, and compare the stand structure (adult sex-ratio, density, height, diameter, and survival of regenerations) of the palm in stands of high versus low elephant pressure (EP). Data were collected in 60 square-plots of 0.25 ha each in five stands of B. aethiopum. Analysis of variance and generalized linear models were used for statistical analyses. Adult uprooting (57.80 ± 3.32%) and sapling grazing (79.87 ± 1.02%) were the most commonly occurring damage. High EP significantly (ANOVAs, $P < 0.05$) reduced adult densities (from 107.60 ± 4.50 individuals ha–1 to 33.50 ± 1.73 individuals ha–1). However, high EP promoted seedling transition to sapling (from 0.10 ± 0.02 to 0.20 ± 0.02), but prevent transition of sapling to juvenile (from 0.12 ± 0.03 to 0.01 ± 0.00). For the adult sex-ratio, no significant variation (Nested GLM with binomial error, $P = 0.82$) between EPs and no significant departure from 50:50 (Exact binomial tests, $P > 0.05$) were observed, suggesting that adult uprooting is not sex-specific. We conclude that high EP limits functional diversity of the *B. aethiopum* in savannah ecosystems, and may cause decline of the palm species. Management actions should improve the survival of sapling palms by the use of barbed wire to protect several patches of saplings from EP. In addition, because the PNP belongs to a regional network of PAs, a regional management plan of elephant populations would yields better outcome.

Key words: *Borassus aethiopum*, Herbivory, Loxodonta Africana, stand structure.

16. Usages de *Bombax costatum* (Malvaceae) dans les terroirs riverains de la réserve de biosphère de la Pendjari, République du Bénin

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Bois et Forêts des Tropiques

http://revues.cirad.fr/index.php/BFT/article/view/ID-BFT-160822

Abstract

Bombax costatum (faux kapokier) est une espèce des zones soudaniennes peu étudiée et sous-utilisée. Cette étude a évalué les connaissances sur les usages de *B. costatum* en relation avec les facteurs socio-démographiques (âge et sexe) et le groupe socioculturel. À cet effet, 118 entretiens individuels semi-structurés ont été réalisés dans les terroirs riverains de la réserve de biosphère de la Pendjari au Bénin. La fréquence relative de citation, la valeur d'usage rapportée et l'indice d'importance culturelle ont été utilisés pour quantifier les usages et l'importance de l'espèce. Au total, 46 usages ont été recensés et classés en huit catégories d'usages dont les plus citées et ayant les valeurs d'importance culturelle les plus élevées sont les usages alimentaires et médicinaux. Le calice est la partie de plante la plus sollicitée pour les usages alimentaires ; il est de surcroît localement commercialisé. Les usages médicinaux impliquent plusieurs organes/parties (calice, feuille, écorce, graine et racine). Les connaissances sur les usages de *B. costatum* variaient significativement entre groupes socioculturels mais pas entre sexe et catégorie d'âges. En effet, les groupes socioculturels Berbas et Gourmantchés contrairement aux Waamas, Natimbas et Peulhs possédaient plus de connaissances sur les usages de *B. costatum* et avaient une pré- férence pour les usages alimentaires. La promotion des usages alimentaires de *B. costatum* peut être envisagée et ainsi servir de point de départ pour sa plus large valorisation. Les études futures devraient toutefois explorer d'autres régions d'occurrence de l'espèce et mettre l'accent sur la valeur nutritionnelle, les revenus générés par la plante, de même que sa propagation en vue de sa valorisation.

Mots-clés : *Bombax costatum*, connaissance traditionnelle, valeur d'usage ethnobotanique, réserve de biosphère de la Pendjari, Bénin.

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17. Inventory and multicriteria approach to identify commercial timber species for priority conservation in Benin

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Bois et Forêts des Tropiques, http://bft.cirad.fr/cd/BFT_333_5-16.pdf

Abstract

Diverses essences forestières, dont certaines sont menacées, sont exploitées pour leur bois, légalement ou non. Les essences prioritaires pour la conservation à long terme doivent donc être définies. La présente étude a permis de réaliser un inventaire des essences exploitées au Bénin et d'identifier les essences prioritaires pour lesquelles des actions urgentes de conservation et de restauration sont nécessaires. Des recherches bibliographiques complétées par des entretiens avec différentes parties prenantes ont été menées afin de recueillir les données requises pour dresser une liste exhaustive des essences prioritaires. Dix critères et quatre méthodes de priorisation ont été utilisés. Au final, l'approche a retenu 10 essences parmi les 15

essences prioritaires définies par chacune des méthodes. Au total, 24 espèces végétales ont été identifiées, appartenant à 9 familles : Fabacées (25 %), Malvacées (20,83 %), Méliacées (16,67 %), Combrétacées (8,33 %), Moracées (8,33 %), Verbénacées (8,70 %), Ébénacées (4,17 %), Rutacées (4,17 %) et Myrtacées (4,17 %). Des mesures de conservation et de restauration sont préconisées d'urgence pour les 10 essences prioritaires ainsi retenues.

Mots-clés : essences forestières, conservation, méthodes de priorisation, Afrique de l'Ouest.

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18. Contrasting population structures of two keystone woodland species of W National Park, Niger.

Inoussa, M. M.[1], Padonou, E. A.[2], Lykke, A. M.[4], Kakaï, R. G.[3], Bakasso, Y.[1], Mahamane, A.[1,5], & Saadou, M.[1,6]

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South African Journal of Botany
https://www.sciencedirect.com/science/article/pii/S0254629916302204

Abstract

This study aims to assess population structure and ecological indicators of woodland vegetation dominated by *Pterocarpus erinaceus* and *Anogeissus leiocarpa* as a basis for sustainable management and conservation strategies. We sampled 34 plots each measuring 30 m × 30 m in W National Park in Niger and analyzed structural parameters (tree density, basal area, Lorey's mean height and size class distribution) and ecological indicators (species richness, Shannon diversity index, Pielou evenness index and Importance Value Index) of woodland in general and for the two key species. Mean tree density was 752.6 stems/ha and basal area was 24.5 m2 /ha in woodlands including 145.4 stems/ha and 14.1 m2 /ha for *A. leiocarpa* and 3.3 stems/ha and 0.7 m2 /ha for *P. erinaceus*. The woodland was composed of 59 tree species belonging to 34 genera and 17 families. *A. leiocarpa* had the highest IVI value (0.93), whereas *P. erinaceus* was among the species with the lowest IVI value (0.03). The mean diameter of both species was higher (24 cm and 47 cm for *A. leiocarpa* and *P. erinaceus* respectively) than the mean diameter in woodlands (16 cm). A "reverse J" shape distribution was found for woodland in general and for *A. leiocarpa*, but *P. erinaceus* showed a left dissymmetric distribution. Findings of this study showed that urgent actions are needed for sustainable management and conservation of some key species especially *P. erinaceus.*

Keywords: Forest inventory Regeneration Size class distribution Woody vegetation

19. Assessing local conservation priorities of useful woody species within agroforestry systems along Ouémé catchment in Benin (West Africa)

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Ethnobiology and Conservation
http://ethnobioconservation.com/index.php/ebc/article/view/103

Abstract

Ouémé catchment experiences increasing degradation of its natural resources due to anthropogenic pressure. Consequently, most of the agroforestry species as well as the cultural and Indigenous knowledge related to them are facing a very high risk of extinction. The present research aimed to assess the biodiversity of the useful woody species in this area and their cultural importance and then prioritize these woody species for conservation purpose. An ethnobotanical survey was carried out among 411 randomly selected households followed by an ecological survey conducted in 69 random plots of 0.15 ha. Ecological and ethnobotanical parameters were calculated and then analyzed. To determine the local priorities species for conservation, a local conservation priority index (LCPI) was computed for each species. The high value of LCPI for a given species indicates the need for a greater level of attention for conservation and management. Fortyfive useful woody species belonging to 21 families dominated by Leguminosae (24.44%) and Anacardiaceae (8.88%) were reported. The fortyfive species were categorized into six use categories by the informants: food, medicinal, construction, fuel, veterinary and technology. The most useful species were *Elaeis guineensis* (UV=0.24), followed by Parkia biglobosa (UV=0.19) and Vitellaria paradoxa (UV=0.18). The prioritization method yielded top ten ranked species: Parkia biglobosa, *Pterocarpus erinaceus*, *Adansonia digitata, Milicia excelsa, Irvingia gabonensis, Vitex doniana, Prosopis africana, Diospyros mespiliformis, Afzelia africana* and *Vitellaria paradoxa*. With the aim of establishing the sustainable management in the catchment, we suggest that more attention be paid to the aforementioned species as part of rehabilitation activities.

Keywords: Conservation priorities, Biodiversity, Local knowledge, Useful plants, Ouémé catchment.

20. Determination of Lethal Concentrations Using an R Software Function Integrating the Abbott Correction.

Savi, M. K.[1], Mangamana, E.T.[1], Deguenon, J.M.[2], Hounmenou, C.[1] and Glèlè Kakaï, R.[1].

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Journal of Agricultural Science and Technology

http://www.davidpublisher.org/index.php/Home/Article/index?id=30549.html

Abstract

Several thousands of chemical substances are registered every year for different purposes, and sometimes many of them are claimed to play the same role. To establish and compare their toxicities, the determination of the lethal concentrations is usually necessary and should account for natural mortality. However, many of the statistical software packages used for that purpose do not readily integrate control mortality or adjust the best link function to the data during the process. This manuscript proposes an "lc" function in the R open source that aims at the effective determination of lethal concentrations. Furthermore, it performs the procedure with the appropriate link function. The "lc" application on the example provided revealed that the complementary log link function is adequate.

Key words: Toxicity, lethal concentration, Abbott correction, binomial family links, generalized linear models, pesticides.

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21. Diversity and prioritization of non timber forest products for economic valuation in Benin (West Africa)

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African Journal of Rural Development
http://repository.ruforum.org/documents/diversity-and-prioritization-non-timber-forest-products-economic-valuation-benin-west

Abstract

Species prioritization is a crucial step towards setting valuation strategy, especially for Non timber Forest Products (NTFP). This study aimed at assessing the diversity and ranking NTFPs for a successful economic valuation. Data were collected through literature review. Seven prioritization criteria were used in different prioritization systems. The top 50 NTFP species obtained by each system were identified and ten NTFP of highest priority occurring as priority across methods were selected. A total of 121 NTFPs belonging to 90 botanical genera and 38 botanical families were found. The top 10 priority were: *Vitellaria paradoxa, Parkia biglobosa, Adansonia digitata, Irvingia gabonensis, Blighia sapida, Tamarindus indica, Dialium guineense, Vitex doniana, Borassus aethiopum and Garcinia kola*. Due to the economic potential and the regional importance of these priority species, appropriate incentives for their valuation are needed and should be reflected in forest policies in Benin.

Key words: Biodiversity, non-timber forest products, prioritization scheme, valuation

22. Local perceptions of interactions between elephants and *Borassus aethiopum* Mart.(Arecaceae) in the Pendjari National Park in Benin

Houndonougbo, J. S.[1], Salako, V. K.[1], Idohou, R.[1], Azihou, F. A.[2], Assogbadjo, A. E.[2], & Kakaï, R. G.[1]

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Bois et forêts des tropiques, http://bft.cirad.fr/cd/BFT_331_33-43.pdf

Abstract

Différents constats indiquent que l'impact des éléphants sur la végétation ligneuse dans les aires protégées devient dramatique. Une gestion durable de la biodiversité dans ces écosystèmes nécessite le respect d'un bon équilibre entre populations d'éléphants et peuplements d'essences ligneuses. Pour y parvenir, les perceptions des habitants et des gestionnaires des aires protégées peuvent éclairer fort utilement les résultats des suivis et inventaires écologiques classiques. La pré- sente étude visait à évaluer les perceptions des gestionnaires et des populations locales quant aux causes, dégâts et conséquences de la pression exercée par les éléphants sur le palmier rônier Borassus aethiopum, actuellement en déclin, ainsi qu'aux options de gestion de cette pression. L'étude a été réalisée dans le Parc National de la Pendjari, une des composantes du complexe de réserves transfrontalières du W-Arly-Pendjari en Afrique de l'Ouest. Des entretiens semi-structurés ont été menés avec 53 personnes issues de trois catégories socioprofessionnelles différentes : administrateurs, écogardes et chasseurs professionnels locaux. La fréquence relative des citations et la corrélation de Pearson nous ont permis d'évaluer, respectivement, le consensus et les concordances des perceptions. Les personnes enquêtées ont fait part d'une forte augmentation du nombre d'éléphants dans la Pendjari, attribuée à une migration significative d'éléphants en provenance des parcs transfrontaliers où la pression du braconnage serait élevée. Cela conduit à une forte pression sur les essences ligneuses, dont B. aethiopum. Malgré les différences professionnelles, des opinions consensuelles et concordantes ont été constatées entre les administrateurs, écogardes et chasseurs professionnels locaux à l'égard des interactions entre éléphants et B. aethiopum. Pour limiter la migration des élé- phants, une approche régionale est proposée visant à protéger les populations d'éléphants (réduction du braconnage) du complexe W-Arly-Pendjari et des réserves voisines.

Mots-clés : palmier rônier, Borassus aethiopum, éléphant, pression, gestionnaires de réserve, savane, Afrique de l'Ouest.

23. Effects of salinity on seedling emergence and early seedling growth of *Irvingia gabonensis* (Irvingiaceae)

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Seed Sci. & Technol.
http://www.ingentaconnect.com/content/ista/sst/2017/00000045/00000002/art00002

Abstract

Ecophysiological traits determining the occurrence and cultivability of *Irvingia gabonensis* are not fully understood. We evaluated the impact of salinity (30, 60 and 120 mmol NaCl) on seedling emergence (rate and speed) and seedling vigour in greenhouse conditions. Vegetative responses of seedlings were also assessed. Salinity levels up to 60 mmol had no significant effect on seed viability. High emergence percentages (83 – 92%) were obtained for treatments up to 60 mmol, while 120 mmol significantly lowered the emergence rate to 10%. However, speed of emergence initiation, emergence completion, and seedling vigour depended on NaCl concentration. This indicates adverse effects of salinity on the emergence of *I. gabonensis*. Likewise, adverse effects on seedlings was correlated with NaCl concentration, as shown by reduced leaf number and size, leaf health and photosynthetic capacity, seedling final weight and root density. Consequently, *I. gabonensis* is a highly salt-sensitive plant species, which explains its northerly geographical distribution in the Guinean forests of West Africa.

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24. Ecosystem service importance and use vary with socio-environmental factors: A study from household-surveys in local communities of South Africa.

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Ecosystem Services
https://www.sciencedirect.com/science/article/pii/S2212041616304302

Abstract

Ecosystem services (ESs) underpin human livelihoods around the world. Understanding how socio-environmental aspects influence stakeholders' perceptions and use of ESs, is important for decision-making processes that target the social expectations. In this study, face-to-face interviews were conducted with eighty-six householders in four villages of Limpopo province (South Africa), to assess the importance and use of ESs. Descriptive rank analysis, ordered logistic regression and Poisson generalised linear mixed-effects models were used. Supporting and provisioning ESs were rated the most important, followed by regulating and cultural ESs. Among the provisioning ESs, timber, firewood and edible plants were the most important, the most cited and used. Age, gender, income and prior recreational experiences played important roles in householders' perceptions. The frequency of collection of provisioning ESs declined with increasing distance to the forest and presence of foothills in landscape, which formed natural barriers.

The results further revealed that employed householders benefited more from these services than unemployed householders. However, there was no significant effect of income variable on the use of the provisioning ESs, suggesting that the collection is more likely oriented towards a domestic usage. The implications of the results were discussed in a context of local development planning

Keywords: Age Cultural valuation Households Perceptions Provisioning ecosystem services Social factors

25. Potential supply of floral resources to managed honey bees in natural mistbelt forests.

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Journal of Environmental Management
https://www.sciencedirect.com/science/article/pii/S0301479716310131

Abstract

Honey bees play a vital role in the pollination of flowers in many agricultural systems, while providing honey through well managed beekeeping activities. Managed honey bees rely on the provision of pollen and nectar for their survival and productivity. Using data from field plot inventories in natural mistbelt forests, we (1) assessed the diversity and relative importance of honey bee plants, (2) explored the temporal availability of honey bee forage (nectar and pollen resources), and (3) elucidated how plant diversity (bee plant richness and overall plant richness) influenced the amount of forage available (production). A forage value index was defined on the basis of species-specific nectar and pollen values, and expected flowering period. Up to 50% of the overall woody plant richness were found to be honey bee plant species, with varying flowering period. As expected, bee plant richness increased with overall plant richness. Interestingly, bee plants' flowering period was spread widely over a year, although the highest potential of forage supply was observed during the last quarter. We also found that only few honey bee plant species contributed 90 percent of the available forage. Surprisingly, overall plant richness did not significantly influence the bee forage value. Rather, bee plant species richness showed significant and greater effect. The results of this study suggest that mistbelt forests can contribute to increase the spatial and temporal availability of diverse floral resources for managed honey bees. Conservation efforts must be specifically oriented towards honey bee plant species in mistbelt forests to preserve and enhance their potential to help maintain honey bee colonies. The implications for forest management, beekeeping activities and pollination-based agriculture were discussed.

Keywords: Forage value Honey bee plant richness Nectar Plant diversity Pollen South Africa

26. Maize Fungal Growth Control with Scopoletin of Cassava Roots Produced in Benin.

Ba R., Alfa T.[1,2], Gbaguidi F.[3], Novidzro K. M.[2], Dotse K.[4], Koudouvo K.[4], Houngue U.[2], Donou Hounsode M. T.[5], Koumaglo K. H.[4], Ameyapoh Y.[3], & Baba-Moussa L.[1]

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International Journal of Microbiology
https://www.hindawi.com/journals/ijmicro/2017/5671942/abs/

Abstract

The chemical contamination of food is among the main public health issues in developing countries. With a view to find new natural bioactive products against fungi responsible for chemical contamination of staple food such as maize, the antifungal activity tests of scopoletin extracted from different components of the cassava root produced in Benin were carried out. The dosage of scopoletin from parts of the root (first skin, second skin, whole root, and flesh) was done by High Performance Liquid Chromatography. The scopoletin extract was used to assess the activity of 12 strains (11 strains of maize and a reference strain). The presence of scopoletin was revealed in all components of the cassava root. Scopoletin extracted from the first skin cassava root was the most active both as inhibition of sporulation (52.29 to 87.91%) and the mycelial growth (36.51–80.41%). Scopoletin extract from the cassava root skins showed significant inhibitory activity on the tested strains with fungicide concentration (MFC) between 0.0125 mg/mL and 0.1 mg/mL. The antifungal scopoletin extracted from the cassava root skins may be well beneficial for the fungal control of the storage of maize.

27. Small population size and large dimension performance of some equal mean discrimination functions

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International Journal of Mathematics and Statistics
http://www.ceser.in/ceserp/index.php/ijms/article/view/4734

Abstract

In this study we consider the problem of classifying a new observation into one of the known groups (pi; i = 1;2) independently distributed multivariate normal when both groups are described by equal mean vectors. The small sample size and large number of parameters performance of four equal mean discriminant functions (Bartlett and Please method (BPM), Bayesian Posterior Probability Approach (BPPA), Quadratic Discriminant Function (QDF) and Absolute Euclidean Distance Classifier (AEDC) were evaluated in classifying observations from two N(mi;Si), p = 10 groups with m1 = m2. The performance evaluation was based on simulated data using reported Balanced and Cross Validation error rates. The BPPA outperformed the other functions. Female liked sex twins data extracted from Stocks (1933) twin data was used for data analysis.

Keywords: Equal mean, Bartlett and please Method, Discriminat functions, Cross-validation

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28. Compliance of the Morphometric Characteristics of Bees in Benin with Those of *Apis mellifera Adansonii*.

Paraïso A.[1,2], Paraïso G.[1,2], Salako V. K.[3], Abiola W.[1,2], Kelomey A.[1,2], Glèlè Kakaï, R.G.[3], Edorh P. A[4]., Baba-Moussa L.[5], Sanni A.[6] & Glitho A. I.[7]

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Journal of Entomology
http://scialert.net/abstract/?doi=je.2017.24.32

Abstract

Background: Only one subspecies of bee, *Apis mellifera adansonii* was described for all West and Central Africa. Preliminary studies carried out in Benin suggested the presence of other subspecies. Objective: The objective of this study was to evaluate the conformity of the morphometric characteristics of bees in Benin with those of *A. mellifera adansonii* described before. Materials and Methods: To this end, 100-300 bees were collected by locality and by hive. The samples were collected from 30 localities (colonies) belonging to 8 phytodistricts and to the three climate zones of Benin. In each locality, 100 bees were measured (except the site of Yarakeou where 60 bees were measured). Thus, 14 morphometric characteristics were measured per bee with a microscope equipped with graduated eyepieces. But three characteristics including the length of the proboscis, the width of the tomentum and the cubital index were used for the tests. Results: The ascending hierarchical classification and the t-tests of student to a sample at 5% threshold were done. The condition of application of the test, that is the normality of the data was previously verified. These analyses

were done using the software SAA v.9.2. The ascending hierarchical classification of 2960 bees measured on the basis of the 14 morphometric characteristics allowed us to identify 10 statistically different morphotypes. The t-tests of student showed that in general, bees in Benin had the cubital index, the length of the proboscis and the width of the tomentum significantly different ($p<0.001$) from those of *A. mellifera adansonii*. Conclusion: Bees in Benin are characterized by a cubital index, a length of the proboscis and a width of the tomentum that are statistically different from those of the subspecies *Apis mellifera adansonii*. However, these three characteristics may not be sufficient alone to deduct that bees in Benin are systematically different from *Apis mellifera adansonii*. Some of the studied morphometric characteristics of bees in Benin are statistically different from those of the subspecies *Apis mellifera adansonii*. We suggest that molecular studies be carried out in order to determine the genotype of the different morphotypes listed.

Key words: *Apis mellifera adansonii*, conformity, morphotypes, morphometric characteristics

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29. The relative importance of climatic gradient versus human disturbance in determining population structure of *Afzelia africana* in West Africa

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Southern Forests
http://www.tandfonline.com/doi/abs/10.2989/20702620.2016.1255406

Abstract

The study aimed to investigate the relative significance of effects of climatic variability and human disturbance on the population structure of the threatened species *Afzelia africana* Sm. ex Pers. in the Republic of Benin in West Africa. Forest inventory data such as regeneration density, tree diameter and total height were compiled from A. africana forest stands under different disturbance regimes in the three climatic zones of Benin. Multiple generalised linear models and non-linear diameter–height equations were fitted to contrast the individual effects of categorical variables, such as climatic zone and disturbance level. Results revealed significantly higher scaling coefficients in less drier regions and low-disturbance stands. The diameter–height relationship was more controlled by the climatic zone than by the disturbance level. Accordingly, the disturbance level contributed only to the intercept of the diameter–height model, whereas the climatic zone significantly influenced both intercept and slope. In addition, when climatic zone and disturbance level were considered as sources of variation in the diameter–height model, the former explained the greater marginal variance. It was concluded that climate has the greater effect on population structure of A. africana in natural stands.

Keywords: Benin, climatic zones, diameter–height model, disturbance, endangered species, natural stands

30. Evaluation of the sustainability of participatory management of forest plantations: The case study of Wari-Maro Forest Reserve, Benin

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Southern Forests
http://www.tandfonline.com/doi/abs/10.2989/20702620.2016.1255409

Abstract

This study assessed ecological and socio-economic impacts of a participatory forest management project in the Republic of Benin. The study focused on the Wari-Maro Forest Reserve and the 'Projet d'Aménagement des Massifs Forestiers' five years after its completion. A forest inventory was carried out using 37 square plots of 729 m2 each to characterise the population structure of two types of plantations established: plantations with exotic species and plantations with native species. In addition, individual surveys were conducted with local households, organs of joint forest management and forestry officers to evaluate their perceptions about the participatory management of the plantations. Finally, the sustainability of the participatory management was assessed with an established rating system. Results showed that plantations with exotic species were more successful than plantations with native species. Local communities argued that they have not been involved in the plantations design but only in the implementation step and that their standards of living have decreased after the project completion. The rating system used showed that the participatory management of plantations had a short-term sustainability. The findings suggest that future projects should be designed and implemented with better participation of local communities as full partners.

Keywords: community livelihood, community participation, joint forest management, structural characterisation

31. Indigenous food ingredients for complementary food formulations to combat infant malnutrition in Benin: a review

Chadare, F. J. [1,2], Madode, Y. E. [1], Fanou-Fogny, N. [1], Kindossi, J. M. [1], Ayosso, J. O. [1], Honfo, S. H.[3], Kayodé, A. P. [1], Linnemann, A. R. and Hounhouigan, J.[1]

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Science of Food and Agriculture http://onlinelibrary.wiley.com/doi/10.1002/jsfa.8568/full

Abstract

This paper reviews indigenous Beninese food resources as potential ingredients for complementary infant foods with the aim to develop affordable formulations for low-income households in each agro-ecological zone of the country. Potential ingredients were selected on their documented nutritional value. The selected foods encompass 347 food resources, namely 297 plant products from home gardens or collected from natural vegetation and 50 animals, either domesticated or from the wild. The compiled data reveal that the distribution of the available food resources was unbalanced between agro-ecological zones. Only a few animal ingredients are obtainable in northern Benin. Most resources are seasonal, but their availability may be extended. A high variation was observed in energy and nutrient contents. Antinutritional factors were identified in some resources, but processing techniques were reported to reduce their presence in meals. In general, ingredients from local tree foods (Adansonia digitata, Parkia biglobosa) were adequate as sources of nutrients for complementary infant foods. Based on this review, local foods for the development of complementary food formulas for Beninese infants and children may be selected for each agro-ecological zone. The approach used is exemplary for other sub-Saharan African countries in need of complementary infant foods.

Key words: local food resource; infant food; standards; nutritional value; Benin

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32. Traditional use of fly larvae by small poultry farmers in Benin

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Abstract

House fly larvae (*Musca domestica*) are a suitable and sustainable source of protein for poultry in Africa, but their traditional use in family farming has never been demonstrated and quantified. A large survey among traditional poultry farmers in Benin shows that on the average, 5.7% of them produce house fly larvae to feed their poultry. In one politico-administrative sub-unit (department) 25.7% of farmer feed their poultry with larvae. The farmers using house fly larvae as protein source tend to have a higher income from poultry farming; have higher level of education and a larger flock than those that do not use larvae. They also give termites to their poultry more often than other farmers. Farmers keeping their poultry in

confinement also use fly larvae more often than those whose flocks are scavenging. Fly larvae are produced by exposing various wastes as substrates to attract naturally occurring flies. A total of 28 substrates used to produce larvae were cited by farmers. The most cited substrates were soy and maize bran, pig and chicken manure as well as animal cadavers. This information will be used to optimise the dissemination of the use of fly larvae in poultry feed to smallholder farmers in Benin. The fact that poultry farmers already produce fly larvae on farm also provides opportunities to integrate indigenous knowledge in the development of new technologies.

Keywords: *Musca domestica*, poultry feed, proteins, insects as feed, family poultry farming

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33. Effets de l'indice de température et d'humidité relative de l'air sur la fécondité des bovins en zone agropastorale de Banikoara (Nord-Bénin)

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e-Journal of Science & Technology (e-JST) http://e-jst.teiath.gr/issues/issue_53/Hounmenou_53.pdf

Abstract

L'effet de l'indice de température et d'humidité relative de l'air (ITH) sur la fécondité des troupeaux bovins a été évalué dans la zone agropastorale de production cotonnière de Banikoara entre 2012 et 2013. L'enquête rétrospective transversale a permis de collecter des informations auprès de 678 ménages agricoles possédant des troupeaux bovins. Au total, 5305 vêlages ont été enregistrés à partir de 12581 bovins dans 490 troupeaux Bariba, en élevage sédentaire et 1221 vêlages obtenus de 3578 bovins à partir de 188 troupeaux Peulhs, en élevage transhumant. Le taux de fécondité et l'âge au premier vêlage ont été comparés par le test t de student, indiquant une absence de différence significative entre les deux systèmes d'élevage. Par ailleurs, l'analyse des variations de l'indice de température et d'humidité révèle qu'elles sont fonctions des saisons. Elles influencent le taux de fécondité tout comme le taux de vêlage. De même, l'étude a fait ressortir que l'âge au 1er vêlage est tardif. En outre, l'ITH mensuel est négativement associé aux taux de fécondité et de vêlage quel que soit le système. Dans un contexte des changements climatiques, il urge de procéder à des sélections et à l'insémination afin d'accroitre les performances de production et de reproduction ainsi que la durabilité économique d'élevage des bovins.

Mots clés: Bovin, vêlage, reproduction, saison, Bénin.

34. Production Fruitière de quatre essences ligneuses dans la forêt de Nassou en Zone Soudanienne Du Bénin

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European Scientific Journal (e-JST) https://www.listerz.com/index.php/esj/article/view/10363

Abstract

Les populations rurales dépendent étroitement des ressources végétales pour leurs besoins quotidiens. La productivité fruitière et semencière de ces espèces est un indicateur de leur potentiel économique et de leur capacité à se régénérer. Elle est également capitale pour définir des stratégies de gestion durable des espèces. La présente étude a évalué la production de fruits et de semences de quatre essences forestières que sont *Vitex doniana, Afraegle paniculata, Diospyros mespiliformis*, et *Kigelia africana* en relation avec la classe de diamètre des individus. L'étude a été réalisée dans la forêt de Nassou en zone soudanienne du Bénin. Un échantillon de 9 à 90 arbres appartenant à quatre classes de diamètre (10-20 cm, 20-30 cm, 30-40 cm, et >40 cm) a été considéré par espèce. La méthode utilisée dans le cadre de cette étude est le comptage des fruits tombés sous l'arbre à travers un ramassage périodique tous les 5 jours depuis la fructification jusqu'à la fin du cycle et de la chute du dernier fruit. Les graines ont été ensuite extraites des fruits. Les modèles linéaires généralisés de la famille de Poisson ont été utilisés pour l'analyse des données. Les résultats ont révélé que la classe de diamètre influence significativement (Prob. ≤ 0.01) d'une part la production de fruits de *K. africana* et *V. doniana*, et d'autre part la production de semences viables de *A. paniculata, D. mespiliformis* et de *V. doniana*. En général la production de fruits et de semences est plus élevée pour les arbres les plus gros (≥ 40 cm). Ainsi, le diamètre des espèces étudiées pourrait être très utile pour l'amélioration génétique de celles-ci avec pour objectif l'augmentation de leur productivité.

Mots clés: Productivité annuelle; fruits; classe de diamètre; forêt; Bénin

Appendix 3: Abstracts of some doctoral research proposals of students in LABEF in 2017

1. *Assessing ethnobotanical patterns and morphological diversity of Moringa oleifera Lam. (Moringaceae) in Benin (West Africa)*

Gandji, K.

Moringa oleifera Lam. (Moringaceae) is an agroforestry species native to India. The species is highly produced and consumed as vegetables in many countries in Africa, Asia, Latin America, and the Caribbean. Moringa is a very useful species in the fight against malnutrition, the improvement of food security as well as in climate change mitigation. Despite this great socioeconomic and environmental importance, M. oleifera is still not well exploited and considered as a neglected and underutilized species. However, little is known about which factors determine local people willingness to grow and consume the species as well as about the species diversity. Gathering these information is expected to improve domestication strategies of M. oleifera as a way to combat food insecurity and desertification and to sustainably mitigate climate change effects through sound policies. The present study aims mainly at contributing to a better domestication and sustainable management of M. oleifera in order to improve income and welfare of populations, to improve food security and to mitigate climate change impacts in Benin. Specifically, it aims to: (i) summarize the current knowledge on M. oleifera and identify the gap of knowledge; (ii) estimate the sufficient sample size needed for a better precision of ethnobotanical indices of M. oleifera and assess its traditional ethnobotanical knowledge patterns; (iii) determine factors influencing the use and cultivation of M. oleifera; (iv) determine factors influencing the specific uses of M. oleifera; and (v) assess the morphological diversity of M. oleifera according to ecological conditions and farmers' management practices. Findings revealed the existence of valuable scientific information about the taxonomy, distribution, diverse utilisations, nutritional value, socioeconomic importance, morphological and genetic diversity, domestication, propagation and management of M. oleifera. Based on these information, knowledge gaps were identified and research and development avenues were suggested and discussed for improved valorisation of the species. Seven use categories were identified including food, medicine, fodder, fencing, coagulant (for water purification), firewood, and gum (from the bark). Food and medicinal use categories had higher fidelity levels. The sufficient sample size needed to get more precision for ethnobotanical indices (overall use value, food ethnobotanical use value, medicinal use value) was identified. Overall, food and medicinal knowledge of M. oleifera were commonly influenced ($P < 0.05$) by age, interaction gender-age, and ethnic group. Moreover, overall knowledge were influenced ($P < 0.05$) by biogeographical zone, and food knowledge were influenced ($P < 0.05$) by gender, education level and biogeographical zone. There was a significant positive relationship (Rho = 0.19; P = 0.0002) between traditional knowledge and geographical distances. Awareness, knowledge of the plant biology, gender, cultivation system and age are factors driving the use of M. oleifera while its cultivation is driven by ethnicity and the main use. Cultivation systems are driven by ethnicity, knowledge of the plant biology and main socio-professional activity. Based on their fidelity levels, the following first ten specific uses were identified: salad and vegetable soup, mixed leaves with rice and couscous, forage, use for treating malaria, hypertension, stomachache, headache, tiredness, diabetes and indigestion. The use of Moringa for treating malaria, headache and diabetes were influenced ($P < 0.05$) by only one factor (biogeographical zones for

the first two and age for the last). Except for the use for treating stomachache which was not influenced by any factor, the other specific uses were jointly influenced (P > 0.05) by at least two factors namely biogeographical zones and at least one of socioeconomic and socio-demographic factors. There was a great variability in morphological traits of M. oleifera according to climate gradient and farmers' management practices. Four morphotypes well distributed between biogeographical zones were identified and only five morphological traits (number of tertiary branches, leaf maximum width, leaf length, pod length and dry pod weight) were the most discriminant. The morphotype of the sudano-guinean zone was found as the best in terms of leaf and pod traits and could be used for either leaf, or pod and seed production specific breeding programs. Implications of findings for the improvement of domestication strategies of M. oleifera were discussed and future research avenues were suggested.

Keywords: Agroforestry system, domestication, morphological traits, quantitative ethnobotany, traditional knowledge, food security, climate change.

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2. *Assessment and analysis of agronomic and ecological aspects of cotton farming systems for a sustainable cotton production in Benin (West Africa)*

Eclou, S.I.

Cotton is the main cash-crop in Sub-Saharan Africa whose estimated population of 856 million in 2010, is projected to exceed two billion shortly after 2050. It plays a very important role in the economy of several African countries, including Benin Republic. However, most current cotton production systems are not sustainable and this could become a significant obstacle to the future development of these countries. Particularly in Benin Republic (West Africa), the massive use of pesticides and other agrochemicals in conventional cotton production methods results in severe environmental and health problems. But No study was conducted in Benin Republic on persistence and degradation of pesticide residues in soils under cotton cultivation. Yet we know that Organic cotton which by definition is cotton produced without chemicals, appears as a solution. However, low productivities observed in biological or organic cotton production systems are an obstacle to the adoption by farmers of these cropping systems. Nevertheless, the existence of biological or organic cotton shows that it is possible to produce cotton without using chemicals. It is in this context this study intends to evaluate and analyse the agro-ecological impacts not only of conventional and organic cotton production systems currently used in Benin but also some innovative cotton production methods which could give good yields and protect more environment and human health. This doctoral thesis study seeks to: (i) review the existing literature on cotton production in Africa, (ii) analyse effects of different cotton production practices on its agronomical performances, (iii) analyse effects of different cotton practices on soil fertility characteristics, (iv) assess pesticide residues impacts following different cotton farming systems, (v) Quantify pyrethroid and organophosphate pesticide residues in soils from cotton production area and (vi) analyse pyrethroid and organophosphate pesticides persistence and degradation in incubation study. This study is being conducted in two different cotton agro-ecological zones of Benin Republic. This research project is funded by the Kingdom of Denmark.

Keywords: *Organic cotton*, agronomical performances, pyrothroid and organophosphate pesticides, Benin.

3. *Empirical comparison of plotless sampling techniques in vegetation studies*

Amagnide, G.A.

Sampling consists in selecting a sample from a large population with procedures for efficient and accurate estimating of parameters of that entire population from measurements made on the sample. To overcome problems of quadrat pattern (size, shape, etc.) in vegetation studies, distance methods or plotless sampling techniques (PST) were developed. This research will (i) analytically improve density estimators from PST by accounting for imperfect detection, measurement errors on distances and spatial pattern of plants and (ii) empirically compare PST in density estimation.

4. *Performance of Generalized Linear and Nonlinear Mixed Models under flexible semi-nonparametric and parametric distributions: applications to plant-plant interactions and gene dispersal in Afzelia africana*

Tovissode, F.

Generalized Linear Mixed Models (GLMMs) and Nonlinear Mixed Models (NLMMs) have now become part of tools commonly used by researchers in all applied sciences. Traditionally built on the normality assumption, these modelling devices have been shown to suffer distributional restrictions, what may substantially bias estimations and mislead decision making. Numerous proposals have thus emerged to tackle some aspects of this problem, essentially by introducing flexibility (skewness and/or kurtosis) in distributions. The new models generally bear more computational challenges than their normal counterplea. This has led to the development of many estimation procedures which have problem-dependent performances. The present dissertation aims at exploring flexible distribution based GLMMs and NLMMs in order to provide a benchmark for practitioners facing the miscellaneous of approaches relaxed. We consider a very large and flexible class of parametric distributions (skew scale mixture of normals) and an equally flexible semi-nonparametric class of distributions. The advantage of these distributions resides in their ability to represent a large range of skewness and kurtosis and the possibility to recover the normal distribution when the data does not support departure from normality. Specifically, our goals are to (1) develop and assess the performance of a Generalized Linear Mixed Model for binary outcome under skew scale mixture of normal random effects; (2) develop and assess the performance of a Generalized Linear Mixed Model for count data under skew scale mixture of normal random effects; (3) assess and compare the performances of Semi-Nonparametric and Parametric Nonlinear Mixed Models; and (4) survey the performance of two deterministic and four stochastic algorithms in fitting Nonlinear and Generalized Linear Mixed Models under Semi-Nonparametric and skew scale mixture of normal distributions. Our objectives will be achieved through development of unified models and simulations studies meant to reveal which model is best suited for a dataset given sample features as sample size, cluster size (number of pseudo-replications) and correlation among predictors; and which algorithm is the most appropriate given sample characteristics (e.g. missingness and importance of noise) and specific model

features (e.g. presence of random intercept, random slopes). The results of simulation studies will be used to provide tutorials demonstrating on *Afzelia africana* survival, growth and spatial genetic structure data, the advantages of the proposed approaches over existing ones.

Key words: Flexible links, extradispersion, skew scale mixture of normals, semi-nonparametric distribution, bridge-logistic distribution, Poisson-Tweedie mixtures

5. *Linear mixed effects models for fitting multivariate longitudinal data: application to natural regeneration of Adansonia digitata L.*

Honfo, S.H

Research experiments in applied sciences such as agriculture, management of natural resources sciences and medicine are often complex and characterized by multiple observations on several variables measured repeatedly over the time (plant growth, study on species' regeneration, climate change, and epidemiology studies). For analyzing such data, the most appropriate method when there is significant correlation between variables of interest is the multivariate linear mixed effects model (MLMM). Various MLMM approaches have been developed and are available. Though, these MLMMs methods present some computational problems due to either the dimension of the joint covariance matrix of the random effects or the number of variables and/or the number of used random effects per variable. How do these methods really perform according to the above computational factors? Which method can be considered as the best one, or which methods are better for which situations? Does the time spacing considered for collecting data influence the performance of MLMMs? These are various fundamental research questions that need to be addressed. Therefore, the present PhD thesis aims at bringing an added value to multivariate linear mixed effects models methods for fitting longitudinal data through (i) the assessment of the performance of MLMM methods according to computational factors; (ii) the assessment of the effect of the variation of time spacing on the precision of parameters' estimation using MLMMs; (iii) the assessment of the effects of biotic and abiotic factors on the regeneration potential of Adansonia digitata L. in Benin using longitudinal data in MLMM framework.

Keywords: multivariate linear mixed effect model, longitudinal data, Adansonia digitata, regeneration

6. *Global optimization in multilayer perceptron neuronal networks*

Hounmenou G.C.

Modeling empirical data for forecasting purposes is a difficult statistical task because of the relationships that underlie the measurements that can be strongly non-linear, non- univocal, noisy, and of dynamic nature. For this purpose, the standard statistical methods used such as regression models, time series for the treatment of these types of data give mostly unsatisfactory results. It is therefore necessary to explore alternative approaches to develop better models. Thus, new tools and methodologies have been increasingly developed and are able to process increasingly complex data. These include: boltz machine, machine-supported vectors, artificial neural networks (ANN). These are inspired by neurobiology and perform

calculations similar to those of the human brain. Attractiveness for ANNs comes from the processing of characteristic information such as nonlinearity, parallelism, noise tolerance, learning ability and of generalization. They are applied in various fields including the field of statistic, physics agriculture, environment, industry, medicine, communication, computer science, electronics, mechanics, insurance automotive, chemistry, biology, air transport, automatic etc. They encompass several types of models, among of them the multilayer perceptron (MLP), have demonstrated their effectiveness in prevision and prediction of empirical data. Often, these data have a high proportion of contaminated observations with errors whose magnitude and structure can be arbitrary. Thus, the problem of global optimization of learning algorithms used in RNA arises. In addition, although neural networks have demonstrated their ability to obtain excellent predictive and estimated performance, the problem of the choice of hyper-parameters is very critical for these networks because the size of the search space increases significantly of exponential way with the number of intermediate layers. The objectives of this thesis are to: (i) define new models and learning algorithms for PMCs that correct the explanatory variables and explain "at best" so as to find the "real" relationship that binds them. This first objective aims at studying the problem of the class convex nonlinear optimization (ii) determine the optimal structure of the PMCs about of the choice of hyper-parameters and sampling size; (iii) analyze their behavior in the face of missing data, and at last, (iv) propose of the cases of applications of non-linear regression using MLP.

7. Comparison of parameter estimation methods used in generalized linear mixed model (GLMM) with applications on ecological data.

Lokonon, B.

The use of Generalized Linear Mixed Models (GLMMs) is widespread in ecology last decades since it is a more flexible approach for analyzing non-normal data when random effects are present. This popularity has led to a lot of methodological research. Despite the availability of accurate methods for estimating GLMM parameters in simple cases, complex GLMMs are challenging to fit. As a result, various approximation methods have been introduced in the literature with different degrees of accuracy. Tthe main problem in parameters estimation with GLMMs is that, in contrast to linear mixed models, likelihood function of GLMMs is analytically intractable. To tackle the intractability, different estimation methods and packages have been proposed. Specific research questions we address in this situation are: Do differences exist in term of robustness among the estimation methods in terms of parameter bias of fixed effects and variances of the random effects? What are the performances of the R packages involved in each estimation method? Through my PhD thesis, I plan to assess, analytically and empirically, the robustness of the existing estimation methods and packages in order to contribute to an accurate use of these methods.

Keywords: GLMM, estimation methods, simulations, packages, performance, ecology.

8. *Effects of elephants on the dynamic of savanna plants in Pendjari Biosphere Reserve in Benin, West Africa*

Gnonlonfoun, I.

Evolutionary processes between animals and plants are the key motors of woody trees dynamic and related ecosystem services delivery in natural stands. Mammalian herbivory can lead to decline and or extirpation of trees species in savannas ecosystems and then influence the food web at multiple trophic levels (Dublin 1991, van der Waal et al. 2016). In West Africa, mega-herbivores are impacting the dynamic of plants species and their related ecosystem services. The main objective of this study is to contribute to sustainable conservation of native biodiversity and sustainable maintaining of ecosystems services delivery in Pendjari Biosphere Reserve in Benin.

Keywords: Trees' strategies, Mammalian herbivory, Plant defense, Ecosystem services, Elephants feeding behavior, Pendjari Biosphere Reserve.

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9. *Effects of abiotic and biotic factors on the early recruitment of the threatened Afzelia africana Sm. (Fabaceae-Ceasalpinioideae) in the Pendjari biosphere reserve (Benin, West Africa)*

Atanasso, J.

Afzelia africana is a threatened woody plant species which population recruitment suffers a real bottleneck in its natural habitats even in protected areas so that very weak potential of regeneration has often been reported. For the understanding of this plant dynamic in natural stands, knowledges of the key abiotic and biotic factors and their interactive effect on *A. africana* regeneration are particular interests. The current research aims to understand the effects of abiotic and biotic factors on the early recruitment of the threatened *Afzelia africana* Sm. (Fabaceae-Ceasalpinioideae) in the Pendjari biosphere reserve (Benin, West Africa). Planning into chapters, the study aims more specifically to: (1) set a revew on the biotic and abiotic factors influencing the natural regeneration of *A. africana* in West Africa, (2) identify the abiotic factors affecting *A. africana* occurrence, density and structures in the Pendjari Biosphere Reserve of Benin (West Africa), (3) determine the spatial structure of *A. africana* in relationship with its conspecific and heterospecific tree species in the Pendjari Biosphere Reserve (PBR) in Benin, (4) assess the interactive effects of abiotic and biotic factors on *A. africana* sm. early recruitment in the Pendjari Biosphere Reserve in Benin (West Africa) and (5) analyse the abiotic and biotic effects on recruitment dynamics of the early stages of *A. africana* in Benin (West Africa).

Key words: *Afzelia africana*, Biotic and abiotic factors, early recruitment, regeneration, Benin

Appendix 4: Abstracts of the scientific seminars in LABEF in 2016

1. *Scientific research and the current challenges of the forest sector in Benin*

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Abstract

Since 1970s, Benin has suffered several forms of climatic stresses among which are abundant rains, long periods of drought which had a devastating impact particularly on agricultural production, means of subsistence, pasture, and natural ecosystems. These rapid changes in the natural and human landscapes led to a process of decision-making and strategic choice between safeguarding of the natural habitats and the agricultural production for livelihoods and economy. At the same time and as most African countries, Benin is currently following the tendency of fast economic modernization. Although this modernization contributes to the country development, it poses serious threats to the natural resources which, if not well managed, could lead to irreversible and catastrophic losses. For the 20 last years, it is noticed an irreversible tendency towards modernity and this has been retransmitted in all the political speeches. As such, the current challenge is to help governments and peoples to be sailed in this transition towards economic modernization with a significant and representative patrimony of fauna, intact forests and natural landscapes and being able to support the needs of the population which depends upon the resources while providing ecosystems services necessary to survival. Thus, it clearly appears that the process of natural resources management is not static, but rather requires a permanent adaptation to take up the challenge. Unfortunately, the management tools of the natural resources do not follow yet the rhythm of the changes observed both in the factors of threats, the tendencies and factors of deforestation and degradation. It is therefore crucial to diagnose the underlying reasons of this decline and to locate ways out which will make it possible to maintain a constant and permanent watch state for an effective management of the forests and other protected areas in Benin. It is now also now clear that no sustainable development can be achieved without scientific and technological knowledge underlying natural resources management. Moreover almost all forest sectors professionals get knowledge from the universities and research centers. The logical question that arises is to know whether the current scientific research programme accompanies sufficiently the process of natural resources management in Benin. This conference is initiated to share points of view on this question and to discuss the mechanisms of inversion of the tendency to support research which truly accompanies daily management of natural resources by integrating the current great challenges.

Keywords: Forests, sustainable management, Scientific research, Forest policies, Republic of Benin

2. Comment analyser les bénéfices des aires protégées pour développer des cercles vertueux d'incitation à la conservation – une démarche basée sur les filières

Dr. Anne Floquet

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Abstract

Dans cette présentation, nous allons présenter une méthode d'analyse des bénéfices attribuables à l'existence d'une aire protégée. Nous nous basons ici sur l'identification des biens et des services générant des ressources mesurables en termes monétaires pour une économie ; ces biens ne constituent bien évidemment qu'une partie des services environnementaux mais la partie qui affecte le plus la décision immédiate des acteurs impliqués dans la conservation. La démarche utilisée est celle du repérage des filières et activités génératrices de revenus issues de ces biens et services identifiés ainsi que l'affectation des valeurs ajoutées à différents niveaux de systèmes (respectivement système local des riverains ou habitants à l'intérieur d'une aire protégée et systèmes régional, national et global). Une aire protégée est ainsi présentée par un ensemble de filières affectant des groupes d'acteurs économiques à influence et importance différenciées.

L'analyse est déclinée et illustrée à partir d'une étude de cas développée dans 3 petits pays à niveaux de vie et organisation de la conservation très contrastée : le Costa-Rica, le Bhutan et le Bénin, avec trois aires protégées contrastées par pays. Au Costa Rica, des incitations marchandes ont été mises en place par l'Etat pour à la fois développer la forêt privée et limiter les activités dans les aires protégées au tourisme et à la recherche scientifique. Les stocks de ressources d'une AP y sont peu affectés sauf parfois par des phénomènes de congestion touristique. Au Bhutan, les habitants vivent dans les aires protégées et sont soumis à des quotas de prélèvements pour certains stocks. L'Etat dépend bien aussi des revenus tirés de ces aires protégées mais ceux-ci proviennent de l'énergie hydroélectrique de petites centrales construites sur le courant. Au Bénin, nous avons identifié des systèmes d'incitation à la conservation bien différents entre un parc naturel (Pendjari), une forêt classée du domaine national (TTK) et une zone humide gérée par les communautés (Hlan). Les filières dominantes y sont respectivement celles du tourisme, celles de l'exploitation forestière et celles d'une multitude de PFNL avec des coalitions d'acteurs dont l'influence et l'intérêt à conserver les stocks sont très contrastés.

Une telle démarche permet d'analyser les aires protégées en termes de bénéfices et non de coûts pour une économie et de faire l'état des lieux des cercles vicieux et vertueux que les choix de filières autorisées et promues provoquent.

Mots clés: aires protégées, gestion durable, économie, services écosystémiques, chaines de valeur

3. Estimation des distances de dispersion génique, du pollen et des graines, à l'aide des marqueurs moléculaires

Dr. Kasso Dainou

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Abstract

L'exploitation forestière implique la diminution de la densité des semenciers et en conséquence une augmentation des distances d'arbres à arbres des essences de valeurs exploitées. Cette augmentation des distances arbres-à-arbres réduit les possibilités d'allofécondation. La conséquence d'une telle réduction est la limitation des flux de gènes, de pollen et des graines qui in-fine peuvent ne pas favoriser la biodiversité. En effet, cette réduction favorise l'autofécondation qui augmente les risques de consanguinité. La connaissance des distances de dispersion génique, du pollen et des graines devrait permettre de suggérer des options d'exploitation durable des essences forestières afin de ne pas limiter les flux de gènes, de pollen et de graines et en conséquence de favoriser la biodiversité. Dans le cadre de ce séminaire, le conférencier discutera de l'estimation des distances de dispersion génique, du pollen et des graines par l'utilisation des marqueurs microsatellites. Le conférencier abordera les concepts clés tels que l'analyse de parenté et de paternité, la distance de pollinisation et la distance de consanguinité. Le conférencier présentera également des études de cas sur des essences des forêts tropicales et montrera l'applicabilité de cette approche a d'autres écosystèmes tropicaux.

Mots clés: analyse de parentés, analyse de paternité, dispersion, gènes, graines, fruits, distance de pollinisation, distance de consanguinité

4. Introduction to web resources

Mr Bienvenu AKODIGNA,

Director of the Information Resource Center at the U.S. Embassy in Cotonou, Benin

March 2017

5. Application of mixed model analysis for crop improvement: prediction of genetic values with BLUP and Bayesian methods

Dr. David Cros,

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Abstract

The selection of elite individuals among a population of candidates requires partitioning the observed phenotypic values (data records) into genetic and environmental effects. This can be done based on a linear mixed model where the genetic values are considered random. One of the major interests of the mixed model is its ability to exploit the genetic correlations arising from the relatedness between individuals. The mixed model can be analyzed with best linear unbiased predictor (BLUP) methodology and with Bayesian approaches. Until recently, the relatedness between individuals was estimated based on pedigree. However, this yield expected relationships, which can differ widely from the value of interest, i.e. the realized relationships. The traditional pedigree-based relationships are now being replaced by molecular relationships computed from a large number of markers covering the whole genome. This opened the way to genomic predictions of genetic values, which gives the possibility of predicting the genetic value of individuals without data records, providing they were genotyped with the same markers as the individuals used to calibrate the genomic model. This new approach is expected to revolutionize plant breeding. This

talk will first give basic information regarding the genome and SNP markers and will present the model of quantitative genetics, gene effects and the computation of pedigree-based and genomic relationships. In a second part, it will show how to predict genetic values by mixed model analysis and will present the genomic selection approach.

Keywords: Linear mixed model, BLUP, quantitative genetics, genomic predictions, breeding value

6. *Caractérisation technologique du bois au Bénin: état des lieux et perspectives*

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Abstract

Les études de caractérisation technologique du bois ont essentiellement pour objectif de valoriser les ressources forestières ligneuses tant du point de vue des forestiers ou des sylviculteurs que du point de vue des industries utilisatrices. Elles permettent de mettre à la disposition de tous les maillons de la chaîne (de la production à l'exploitation forestière), des données scientifiques nécessaires à leur prise de décision. En effet, dans l'industrie du bois, la connaissance des caractéristiques technologiques d'une essence donnée est un préalable pour son exploitation rationnelle et justifiée. C'est pourquoi dans les pays occidentaux, les caractéristiques physicochimiques, mécaniques, biologiques et anatomiques de la plupart des essences forestières sont aujourd'hui maîtrisées. Cette maitrise justifie largement le fait que la majorité des essences utilisées pour régénérer leurs forêts exploitées sont essentiellement locales. Ceci participe à la conservation de la biodiversité autochtone dans ces pays. A l'opposé, malgré les efforts du Centre Technique Forestier Tropical (CTFT) et du Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD) sur la caractérisation des bois tropicaux, la régénération des formations forestières en Afrique se fait en général avec des essences exotiques comme l'eucalyptus, l'acacia, le teck, le filao, le gmélina, le catapa, etc. au détriment des essences locales. Ceci participe à l'érosion de la diversité floristique des forêts tropicales. Au Bénin, le constat est plus préoccupant. En effet, on note une insuffisance de travaux de recherche sur la connaissance technologique des essences forestières autochtones. En conséquence, les 112 000 ha de plantations forestières du Bénin sont essentiellement constitués d'essences exotiques dont principalement le teck. Pour remédier à ce problème de dégradation de nos ressources forestières locales, il est important de les identifier et de procéder à la caractérisation technologique de leur bois. Du fait de l'augmentation sans cesse croissante des besoins en bois des populations et de la demande en terres agricoles, les étendues forestières connaissent une forte régression (FAO, 2015). Cette pression sur les ressources forestières se traduit par la disparition progressive des « éléphants du monde végétal » que sont les bois nobles tels Prosopis africana, *Anogeissus leiocarpa*, *Pterocarpus erinaceus*, *Milicia excelsa* et *Afzelia africana*. Une disparition qui n'est pas prête de s'arrêter tant les pratiques des marchés nationaux et internationaux des bois tropicaux restent traditionnellement et durement ancrées dans le commerce des essences dites de « référence ». Ce déclin des espèces forestières s'explique aussi par une faible connaissance technologique des essences peu exploitées. Pour pallier ce déficit de connaissance, le Laboratoire de Physique du Rayonnement (LPR) à travers son unité Physique et Mécanique du Matériau Bois s'est depuis quelques années attelé à la caractérisation technologique de certaines essences autochtones dont *Cedrela odorata, Ceiba pentandra, Anthonotha fragrans, Borassus aethiopum*, etc. La connaissance des caractéristiques

technologique des bois des essences connues et peu connues permettra de mieux positionner les bois du Bénin, de mieux les gérer en offrant des alternatives crédibles aux bois nobles en voie de disparition. C'est également une opportunité pour développer de nouvelles filières de bois au-delà de celles actuellement en vigueur. Dans cette communication, le conférencier fera l'état des lieux des recherches sur les caractéristiques technologiques du bois au Bénin, les recherches en cours au LPR sur la thématique ainsi que les résultats déjà obtenus et les perspectives.

Mots clés: Bois d'œuvre, propriétés du bois, gestion durable, essences de valeurs, forêts

7. *Biodiversity Informatics for conservation and sustainable utilization of natural resources*

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Abstract

Biodiversity informatics is a relatively new field of investigation in Science. It is concerned with occurrence data collection on species of all kingdoms, their quality-check, processing, and geographic representation for conservation of biological resources. Benin is a country member of the Global Biodiversity Information Facility (GBIF) since 2004 and makes great efforts in data publication and data use. At a continental scale, Benin is currently the second most data provider following South Africa. As of today, occurrence data published by Benin are approximately 400,000 but are still insufficient when geographic, environmental, and taxonomic gaps are of concern. Next priorities actions towards sustainable management of natural resource in the country, include those gaps filling and long-lasting system of in-depth capacity building based on a sound curriculum of master and PhD in biodiversity informatics to enable massive data collections, publications, and use to inform policy makers and natural resource managers on biodiversity conservation.

Key-words: Biodiversity informatics, occurrence data, in-depth capacity building, curriculum, natural resource conservation, Benin

8. *A new call for a paradigm shift and theory driven ethnobotany*

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Abstract

Ethnobotany, the science of survival, has evolved from a discipline that largely documented the diversity of plant use by local people to one focused on understanding how and why people select plants for a wide range of uses. This progress has been in response to a repeated call for theory-inspired and hypothesis-driven research to improve the rigor of the discipline. Despite improvements, recent ethnobotanical research has over-emphasized the use of quantitative ethnobotany indices and statistical methods borrowed

from ecology, yet underemphasized the development and integration of a strong theoretical foundation. To advance the field of ethnobotany as a hypothesis-driven, theoretically-inspired discipline, it is critical for emerging ethnobotanists to be exposed to ethnobotanical theories in a systematic way. I developed over four years an advanced undergraduate course on theory and methods in ethnobotany that attracted the interest of students. This course taught students how to critically read published papers, identify major scholarly trends and theories in the discipline, and use it as a starting point for their hypotheses. Such effort led to published papers in peer reviewed journals by student participants, suggesting that a large-scale implementation of this instructional approach can yield tangible results. For this effort to expand beyond this case study, I postulate that providing a clear synthesis of existing theoretical lines of research on people-plant interactions will focus future ethnobotanical research toward delineating the theoretical bases for plant selection and use by people. To achieve this, with doctoral students in my lab, we reviewed seventeen major theories and hypotheses in ethnobotany that can be used as a starting point for developing research questions that contribute to advancing our understanding of people-plant interactions. For each theory or major hypothesis, we identified its primary predictions and testable hypotheses and then discuss the degree to which these predictions or hypotheses have been tested. Developing research projects to test these predictions will make significant contributions to the field of ethnobotany and create the critical mass of primary literature necessary to develop meta-analyses and to advance new theories in ethnobotany.

Keywords: hypothesis-driven research; medicinal plant selection; optimal defense theory; utilitarian redundancy model; taboo as luxury; theory in ethnobotany.

9. Uncovering the evolutionary history and historical biogeography of cycad

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Abstract

Cycads are a fascinating plant group sharing morphological characteristics of ferns and angiosperms. They had once a worldwide distribution particularly in the Mesozoic era but the extant cycads, which diverge around 12-2 Ma are restricted to tropical and subtropical regions of the world. However, our knowledge of their evolutionary history and historical biogeography is poor. In this presentation, I will elucidate the diversification history of Cycads genus by genus and highlight potential correlates of the observed patterns. I will further elaborate on their historical biogeography to identify ecological forces that may have shaped their current geographic distribution. Finally, my talk will question the future of cycads in the face of the ongoing extinction crisis.

Keywords: diversification, dispersal, extinction, speciation

10. Diversity and Biomass relationship in forest ecosystems: from political to scientific considerations

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Abstract

Biodiversity conservation and climate change are two most debated topics among scientists, managers and policy-makers, manifested by international initiatives such as The Convention on Biological Diversity, The United Nations Framework Convention on Climate Change, The Paris Agreement, etc. In essence, most forest ecosystem functions and services are vital for human beings, yet climate regulation services are particularly relevant with regard to increasing anthropogenic greenhouse gas emissions in the atmosphere and its subsequent adverse effect on climate. On the other hand, conservation of natural forest ecosystems is seen as springboard for reduction of deforestation rate and maintaining biodiversity. With the large greenhouse gas emissions due to industrialization, deforestation and forest degradation, care should be given to management policies aiming to balance the production of food, fibre and fuel while protecting biodiversity and contributing to regulation of global climate change. While it is theoretically acknowledged that clear understanding of the role of these forests in carbon sequestration and climate regulation would support the motives behind biodiversity conservation, analytical evidence is needed as decision support framework. In this presentation, I wish to build from political and scientific considerations to elaborate on the so called "biodiversity-ecosystem function" (BEF) relationship. (1) I will focus on single case of ecosystem function (biomass production, also related to carbon stock and local climate regulation – even if not straightforward); (a) aspects of biomass estimation (destructive, semi-destructive and non-destructive) will be addressed, and with regards to (b) stand- (first phase) and tree- (second phase) sampling, (c) biomass equations, (d) Up-scaling from tree to plot and from plot to stand levels. (2) I will next elaborate on biodiversity components such as taxonomic diversity, structural diversity, functional diversity and dominance. (3) The relationship between carbon storage and biodiversity components will be the final focus. I will present a scrutinized analysis of the effects of taxonomic diversity, functional diversity and functional dominance on biomass and carbon stock, through Structural equation and linear mixed-effects modelling, and testing for niche complementarity and mass-ratio hypotheses in forest ecosystems. (4) I will end the presentation by adding some perspective taste on existing gaps and future compelling research studies in the West African context.

Keywords: Allometry, Climate change, Forestry, Policies, functional traits

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