UNIVERSITÉ D'ABOMEY CALAVI

FACULTÉ DES SCIENCES AGRONOMIQUES

LABORATOIRE D'ÉCOLOGIE APPLIQUÉE

2012 SCIENTIFIC ACTIVITIES REPORT OF THE LABORATORY OF APPLIED ECOLOGY (LEA)

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March 2013

Dépôt légal N°6624 du 3/04/13 Bibliothèque Nationale, 2è trimestre, Bénin
ISBN : 978-99919-1-317-9

Foreword

The Laboratory of Applied Ecology (LEA) of the Faculty of Agronomic Sciences (FSA (University of Abomey-Calavi, UAC-Benin) was created in 1994 by Prof Brice Sinsin.

LEA is one of the leading institution of research on natural resources management in Benin. The major research fields in which LEA is currently involved include (i) desertification and land degradation, biodiversity and climate change, (ii) carbon stock measurement and monitoring of carbon sequestration , (iii) Agriculture Productivity and capacity building in organic agriculture, (iv) ethnobotany and new crops development; (v) management of traditional agroforestry systems and humid zones; (vi) ecological restoration of degraded areas; (vii) conservation and sustainable management of wild palms; (viii) management of Non Timber Forests Products; (ix) management of protected areas (National Parks, hunting zones, community conservation areas); (x) bio Monitoring of wildlife; (xi) red list of threatened plants and wildlife.

Scientific research at LEA up to now has yielded more than 300 scientific publications in peer-reviewed international journals, books and proceedings of scientific conferences. Moreover, LEA has executed and been involved in several projects (e.g DADOBAT-UE; SUN-UE; BIOTA-West; LOEWE; UNDESERT; Edulink-European Union) on sustainable management of natural resources or/and tree domestication in Africa.

Up to date, the major achievements of LEA are the following: (i) climate change, vulnerability assessment and natural/climatic risk management in the coastal area of Benin, (ii) conservation and management of more than 10 forest genetic resources in Benin (e.g: *Adansonia digitata; Blighia sapida*; *Caesalpinia bonduc ; Irvingia gabonensis ; Pentadesma butyracea ; Sclerocarya birrea; Tamarindus indica* ; *etc..) ;* (iii) management of more than 10 traditional agroforestry systems involving medicinal plants in Northern Benin (e.g Community gardens of Papatia, Monts Kouffé, Dangbo, Porga, etc..) ; (iv) ecological restoration of more than 5 degraded areas (E.g. Lama forest reserve and Swampy forest of Lokoli in Southern Benin ; Dry dense forest of Bassila and Wari Maro in Northern Benin; etc.) ; (v) management of at least 5 protected areas in Benin (Biosphere Reserves of Pendjari and W in Northern Benin ; three forests reserves, Goungoun and Sota forests in Northern Benin ; Lama Forest reserve in Southern Benin ; etc.) ; (vi) Red list of threatened plants and wildlife in Benin (IUCN Red Book of Benin) ; (vii) remote sensing and mapping of vegetation (Swampy Forest of Lokoli, Dense Forest of Lama; Biosphere Reserves of Pendjari and W; etc.); (vii) atlas of biodiversity of Benin.

LEA works closely with many international and natonal partners (research institutions, NGOs, local communities and decision makers). LEA networks and working groups include:

- About 10 Professors and 20 Associate Professors from many Departments (Regional Planning, Geography, Chemistry, Soil Science, Botany, Socio-economics, etc..) at the University of Abomey-Calavi ;
- International Scientific Groups such as AETFAT, IUCN (WCPA,;SSC ; CWRSG) etc.;

- International Institutions involved in nature conservation and biodiversity management i.e., World Union for Nature Conservation (IUCN), Bioversity International (ex-IPGRI), World Agroforestry Centre (ex. ICRAF), etc.;
- Networks such as the South Saharan African Forest Genetic Program (SSAFOGP), Society for Ecological Restoration International (SERI-USA), African Network for Agriculture, Agroforestry and Natural Resources Education (ANAFE / ICRAF), African Forest Research Network (AFORNET-Kenya), African Expert Group on Plant Conservation (GSPC-CBD initiative), etc.
- NGOs and Universities (Belgium, Burkina-Faso, Cameroon, Canada, Côte d'Ivoire, Denmark, France, Ghana, Germany, Japan, Mali, Niger, Nigeria, The Netherlands, Senegal, Sierra Leone, Switzerland, Togo, US, etc.).

This report is the sixth edition following five consecutive previous report since 2007. It is intended for several audiences of researchers in Benin and abroad, partners, developers, donators and other professionals interested in the fields of applied ecology. It summarizes the research activities which were performed at the laboratory in 2012 and is organized into eight major sections. Section 1 relies on the methodology used to gather information included in the report and shows how various indices have been calculated. Section 2 focuses on the types of research (individual, national teams, regional teams and international teams), types of publications (thesis, peer review articles, proceedings, technical reports, and newsletter), trends of publications for the last fourteen years (1998 – 2012) and the analysis of language of publications according to the types of publications at the laboratory. Section 3 provides a summary of conferences and seminars organized by the LEA in 2012 and those attended by researchers at LEA. Section 4 describes the research projects and research grants obtained at the laboratory in 2012 whereas section 5 shows details about active human resources at LEA as well as visitors who were in the laboratory in the framework of bilateral collaboration. Section 6 discusses the research activities performed at the laboratory in 2012 while section 7 shows the used references. The appendixes are presented in the section 8, showing full details on references of the different types of publications, research projects and grants as well as on conferences and visiting research in the laboratory. Finally, abstracts of publications in 2012 in peer review journals have been presented in the section 9 to allow easy searching and understanding of the full length papers.

1. Data collection

The methodology used for this report was mainly based on the research activities performed by researchers and students from the laboratory in 2012.

Firstly, information related to dissertations (PhD and masters' students), scientific articles (published, in press or under review) in peer-review journals and those published through proceedings, books of abstracts and technical reports were used. For each category of publication, the indices of specialization related to the scientific fields in which the works have been performed were assessed. Also, as far as the published papers in peer-review journals are concerned, two groups of papers were established: articles with Impact Factor and those without Impact Factor (Web of Science of Thomson). Only the publications of which address of authors and/or co-authors refer to LEA were considered. Furthermore, collaborations and co-publications with scientists from developed countries and African countries have been detailed throughout the report.
The types of research were expressed respectively as the ratio between the number of publications produced individually or by co-publication with national, regional or international teams and the total number of publications in the laboratory.

Trends of publications from 1998 to 2012 were assessed both for proceedings and published articles in peer review journals (with Impact Factor or not). The ratio French/English was computed for various types of publications including the ones in press.

For data processing, the following indices were calculated:

- *Specialization Index of publications* which is the ratio between the number of publications in a given field or discipline and the total number of publications when considering all disciplines;
- *Impact Factor (IF) Index of Publications* for a given field of publication which is the ratio between the number of publications having an Impact Factor and the total number of publications in peer review journals related to the considered field of publication;
- *Weighted Impact Factor Indexof a given field of publication* which is the product of the Impact Factor Index of Publications and the arithmetic sum of impact factor indices as described in the web of science of Thomson;
- *Index of co-publication at country vs. continental level* which is the ratio between the number of co-publications at country vs. international level and the total number of co-publications in the laboratory.

Information related to the conferences and seminars (organized by the laboratory and the ones to which the researchers from the laboratory have participated), research projects, grants, prices and awards are presented in the report.

To allow the assessment of the full references used to compute this report, a so called session "appendixes" has been inserted at the end of the report as well as the abstracts of the published papers in the peer review journals.

2. Types of research and publications at LEA in the year 2012

2.1 Type of research at LEA

In the year 2012, the published articles were mostly produced by national teams (27 papers out of 43) 26 percent of original research papers from LEA teams were pblished in international journals with an IF. In most cases, these papers involved international partners (Figure 1).

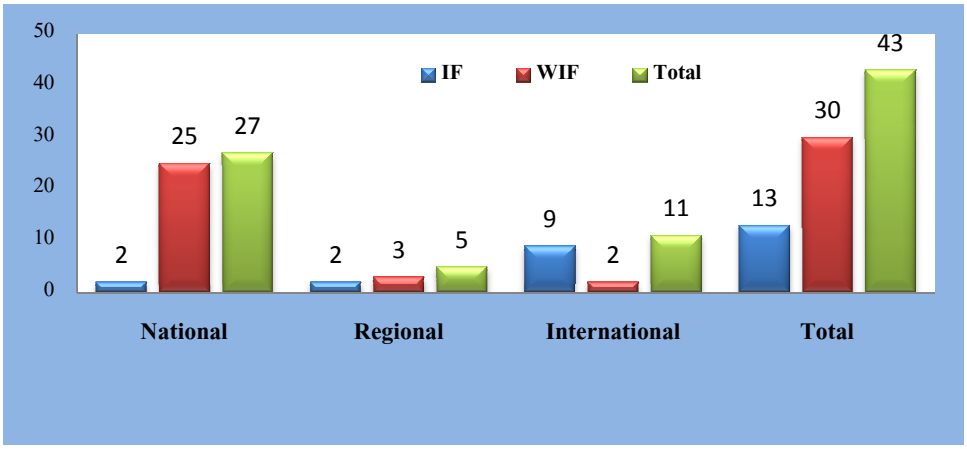

Figure 1: Spatial context of research activities in LEA in the year 2012

2.2 Type of publications at LEA in the year 2012

2.2.1 Theses at LEA

The number of enrolled students in MSc degrees has globally decreased from 2007 to 2012 as opposed to the number of PhD students (Figure 2). Details about research topics and candidates are shown in appendices 1, 2 and 3. In 2012, there were thirteen students who defended their agronomist degree and Master theses in the LEA. Moreover, six PhD students have defended their PhD in LEA in 2012.

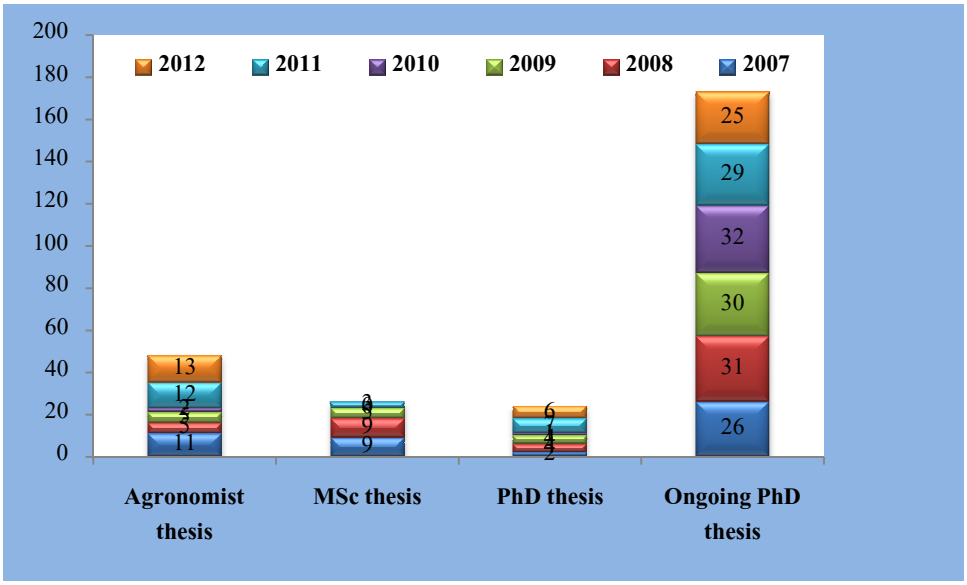

Figure 2: Trends of types of defended and ongoing PhD Theses from 2007 to 2012

2.2.1.1 Ongoing PhD theses at LEA in 2012

In 2012, six main fields of research were covered by the PhD students at LEA, with Forest and Plant Ecology management and Desertification and land degradation being respectively the most and less represented (Figure 3). Figure 4 highlights that LEA research teams have mainly specialized in the field of wildlife management, forest and forest plant ecology management (Figure 4). This is congruent with the laboratory's main research projects.

56 % of the students enrolled in PhD have already spent more than 4 years for their research activities (Figure 5). Among the drivers of such low working speed is that many PhD students at LEA are simultaneously working in the public administration and used to spend more or less half of their time for their research activities.

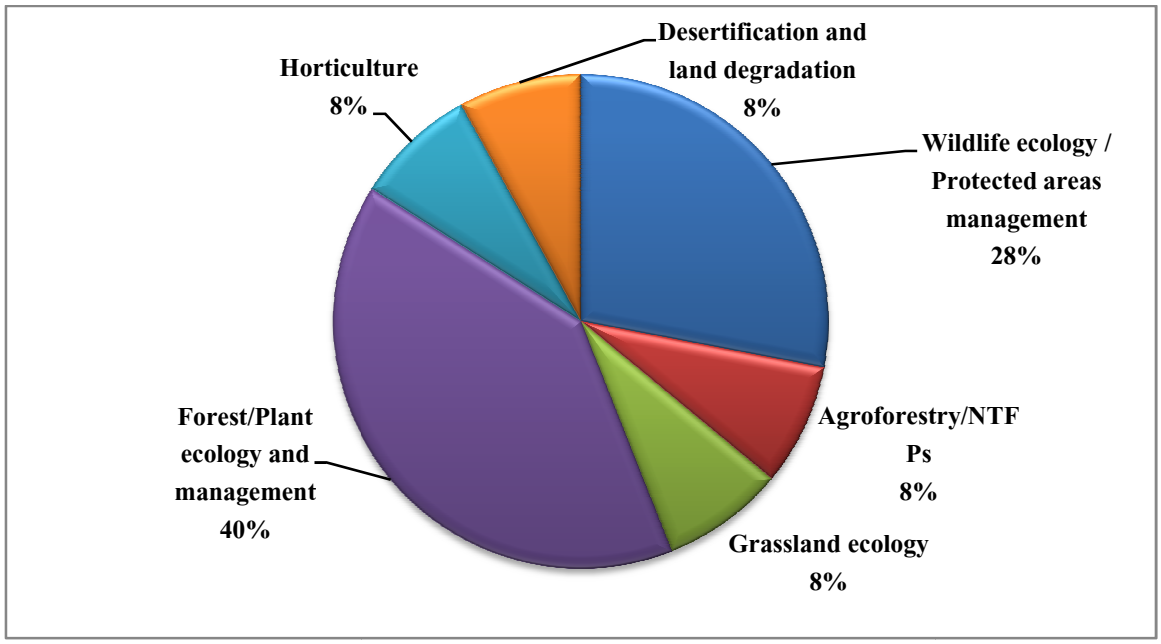

Figure 3: Spectrum of ongoing PhD thesis and related field of research in 2012

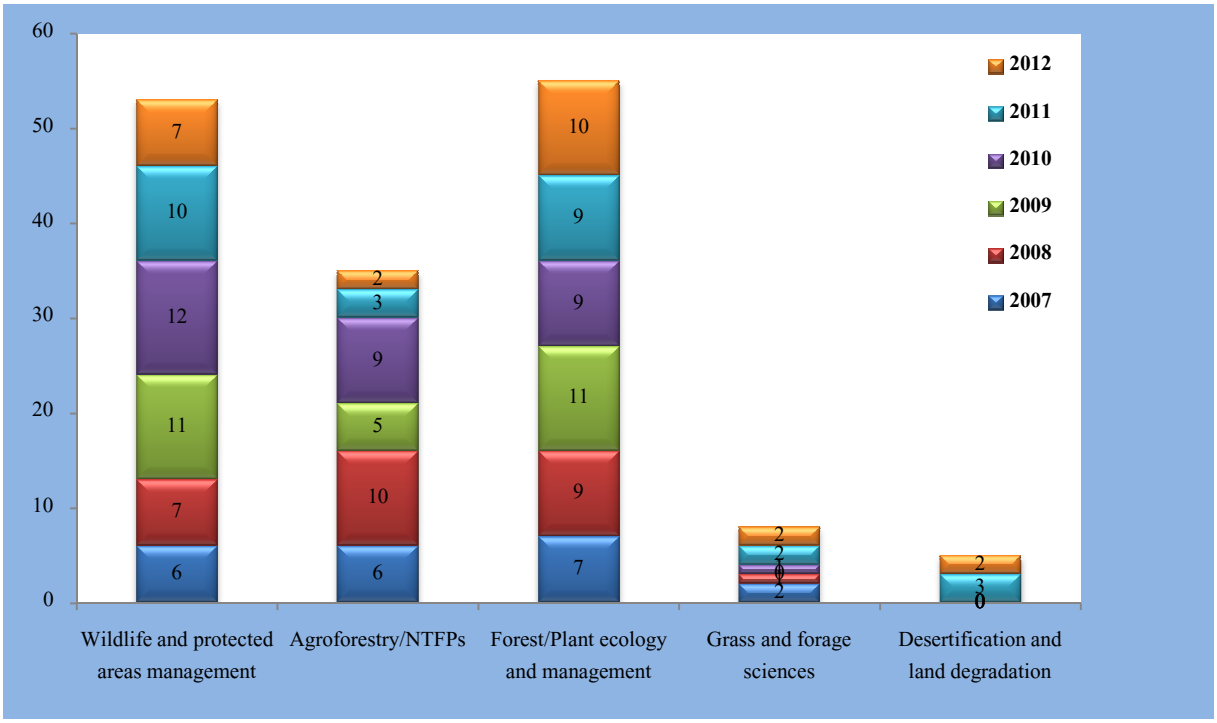

Figure 4 : Trends of ongoing PhD thesis according to the fields of research from 2007 to 2012

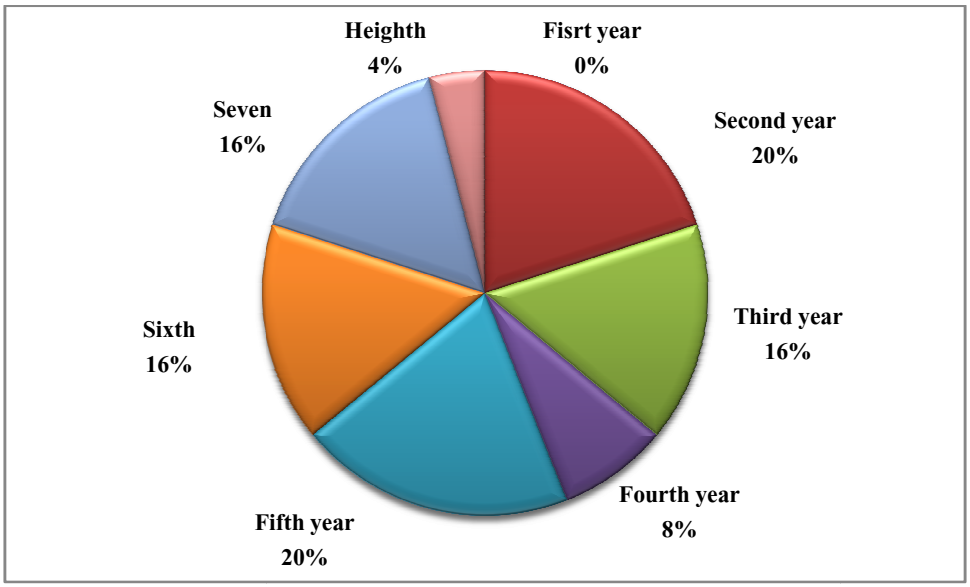

Figure 5: Typology of PhD students in LEA based on the number of year related to their research activities

2.2.2 Scientific productions at LEA in 2012

In 2012, 82 scientific publications were produced by LEA teams in peer-reviewed journals: 47 published; 23 in press: 23; under review: 12. Moreover, 6 articles were published in proceedings, 22 abstracts in the books of abstracts and 3 as technical reports.

2.2.2.1 Publications in peer review journals

(i) Number, categories and impact factor indexes of publications

The published articles in 2012 are mostly in the peer review journals without IF (53.84 %) compared to the number of published papers in reviews with Impact Factor (46.15 %) (Figure 6). The number of in press/under review articles (23) in the journals with Impact Factor in 2012 is higher than the ones without Impact Factor (12). The same trend was observed in previous years. As such, we can assume that researchers of LEA are improving their scientific capacities in publishing their papers in peer review journals with IF. Full references (authors, journals, etc.) of those publications are shown in appendices 4, 5, 6, 7, 8 and 9.

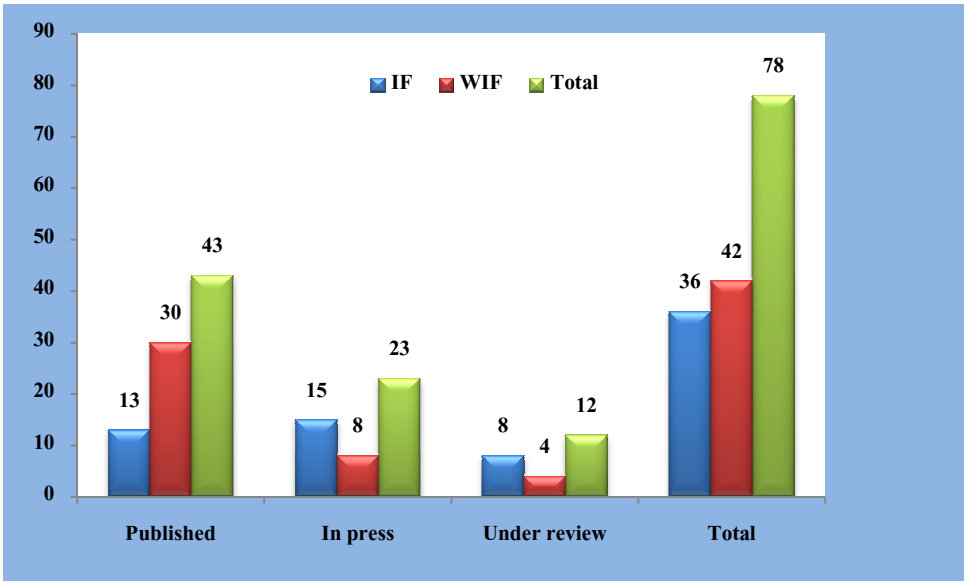

Figure 6 : Spectrum of scientific productions of LEA in 2012

(ii) Specialization Indexes of publications

a) Published articles

The published articles in 2012 cover as the previous year various fields of research including Ethnobiology (23 %), wildlife and grassland (16%), forest and plant ecology (16 %), plants biodiversity (9 %), agriculture and agroforestry (7 %), genetic conservation (7 %) climate change and risk assessment (7 %), genetic and molecular biology (7 %), economy botanic (5 %) and biometry (3 %). Most articles were published in ethnobiology, wildlife and grassland, forest and plant ecology which are the main research's field of LEA.

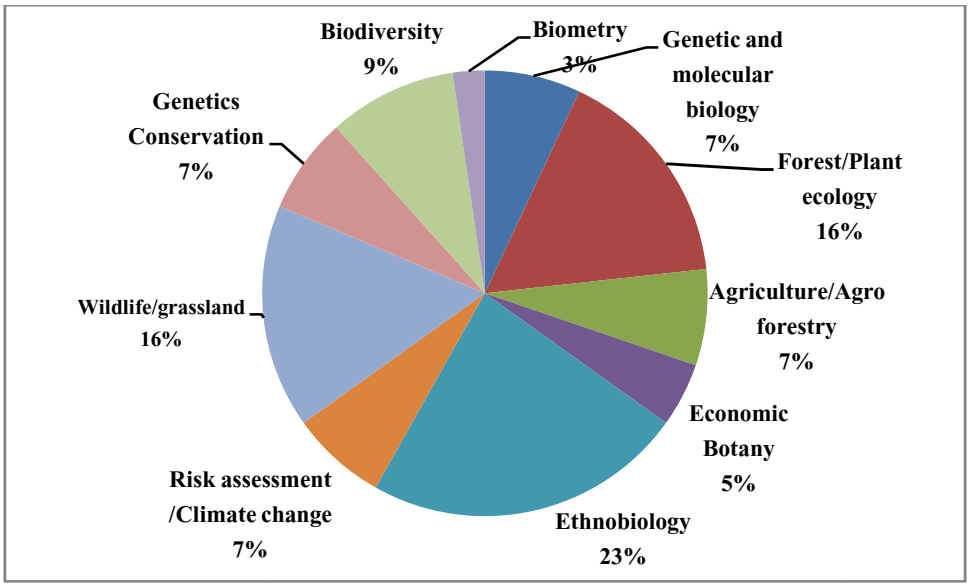

Figure 7 : Published articles according to the fields of research in 2012

b) Articles in press

Forest and Plant Ecology (35 %) Wildlife and Grassland (13%), Agriculture and Agroforestry (13%), Ethnobiology (9 %) and Plants biodiversity (9 %) are likely to provide more original research papers in the next year than Economy Botanic (4 %), Genetic Conservation (4 %) and Genetic and Molecular Biology (4 %) (Figure 8).

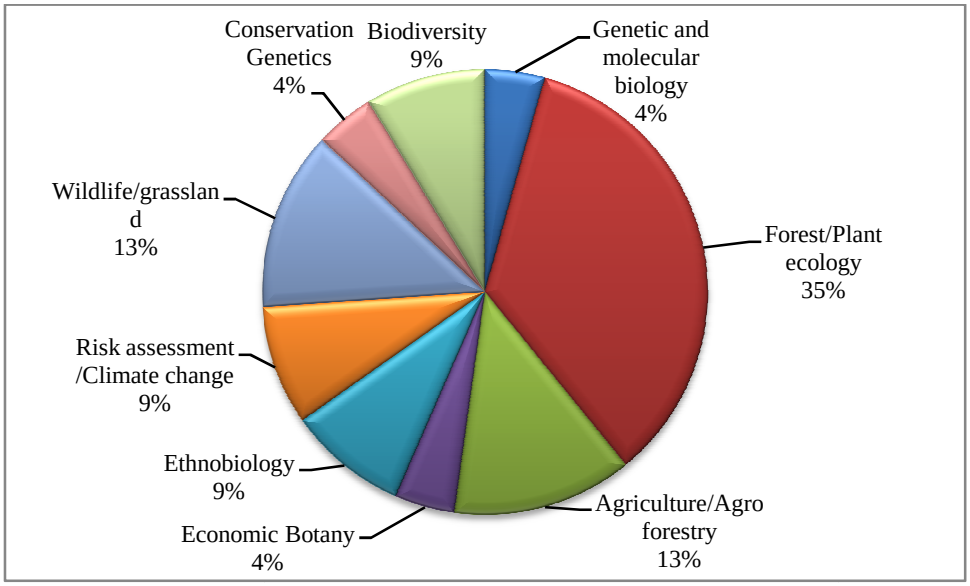

Figure 8 : Articles in press according to the fields of research in 2012

c) Articles under review

The articles under review also cover the same fields of disciplines as the ones published and in press. Fields having more articles under review were Forest and Plant Ecology (50 %), Ethnobiology (17 %), Wildlife and Grassland (17 %), Agriculture and Agroforestry (8 %) and Risk assessment and Climate change (8 %). These fields were also found to contribute more

in articles published and in press confirming these areas as more scientifically productive areas within LEA.

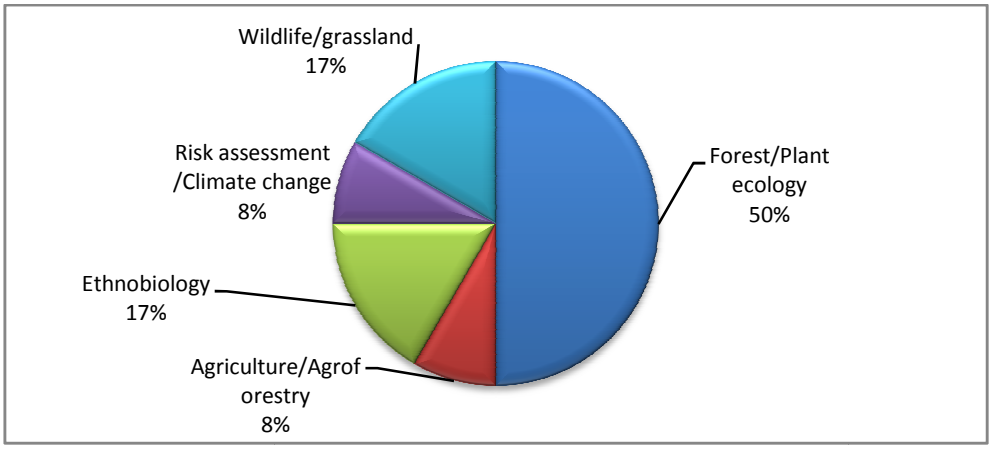

Figure 9: Articles under review according to the fields of research in 2012

(iii) Weighted Impact Factor Index of publications

Publications which have highly contributed to gain the Impact Factor of the laboratory in 2012 were related to Agriculture and Agroforestry followed by publications in Forest and Plant ecology and Ethnobiology (table 1). Therefore, these fields of publication are the ones in which the recorded scientific publications in LEA had the highest Impact Factor in 2012.

Table 1: Weighted Impact Factor Indices of publications according to the disciplines of specialization

Field of publication	*Total number of publications related to the field in peer review journal*	*Total number of publications related to the field in the reviews having an impact factor*	Weighted Impact Factor indices
Wildlife/grassland	7	1	**0.14** (0.980)
Ethnobiology	11	3	**1.056**(2.390, 1.482)
Forest/Plant ecology	7	4	**1.136** (0.697, 0.383, 0.454, 0.454)
Agriculture/agroforestry	3	2	**1.367** (0.764, 1.2875)
Risk assessement/climate change	3	2	1.83 (1.538, 1.206)
Biodiversity	4	0	**0**
Genetic conservation	3	1	**0.54**(1.629)
Genetic and molecular	3	1	**1.00**(3.004)
Economic botany	2	0	**0**

(): The numbers in bracket are the Impact Factor (IF) recorded respectively for each article having an IF in a given field of publication

(iv) Indices of co-publications in peer review journals

a) Country level

LEA works with a wide partnership at local and international training and research institutions. Research teams within LEA used to publish their research papers in collaboration with national and international scientists (figure 10). At country level, most of the publications were written with researchers from Benin (75 %), Belgium (17 %), Germany (5%), and the Netherlands (3 %).

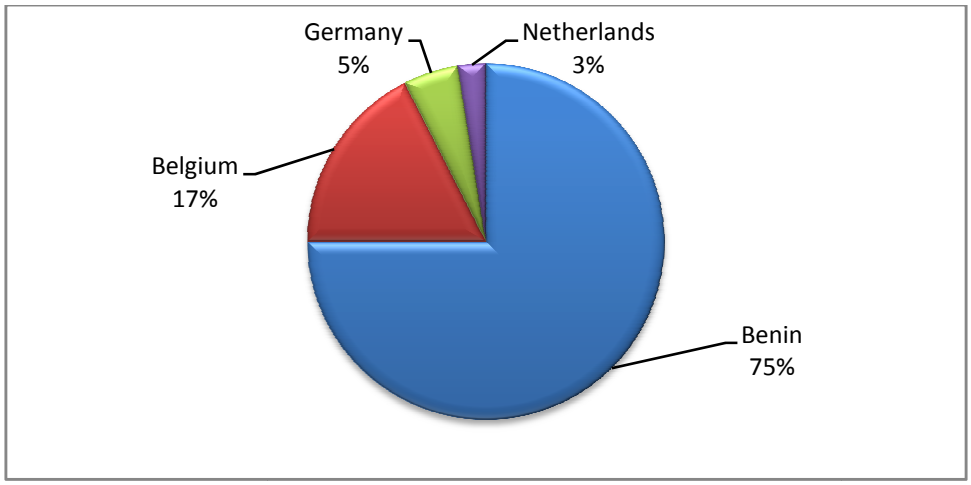

Figure 10: Diversity in indices of the LEA co-publications in peer review journals at countries scale in 2012

b) Continental level

At continental scale, the most important articles were co-published with Africans (74 %: mainly Beninese) and European scientists (26 %) (Figure 11).

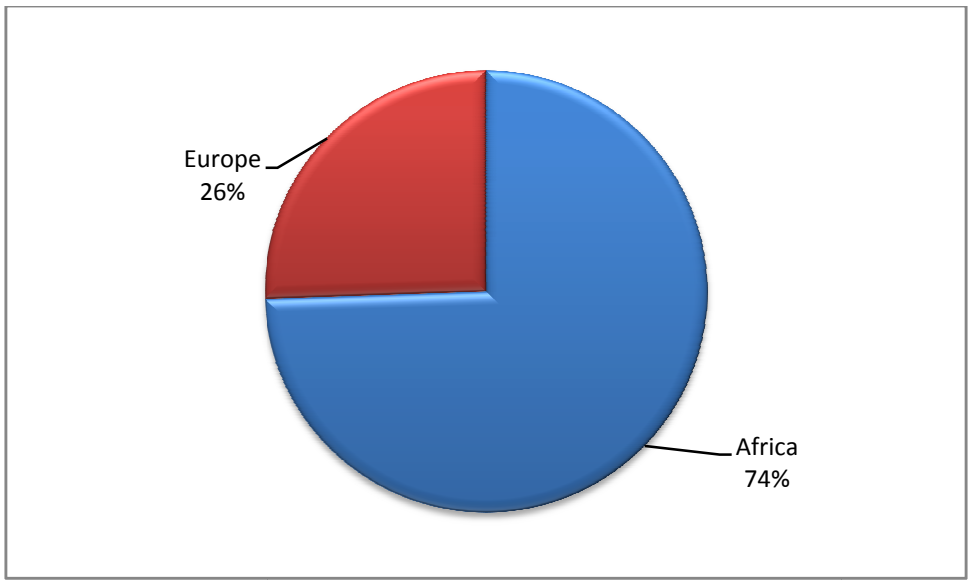

Figure 11 : Diversity in indices of LEA co-publications in peer review journals at continental level in 2012

2.2.2.2 Proceedings: number of publications and indices of specialization

Six articles were published in 2012 as proceedings and were related to agriculture and economic (67 %) grassland and plant ecophysiology (33 %) (appendix 10).

2.2.2.3 Trends of publications in peer review journals and proceedings from 1998 to 2012

Publications in peer review journals have globally increased from 1998 to 2012 with the highest peak in 2011. Publishing in peer review journals with Impact Factor has started in the laboratory in 1994 with 1 to 3 publications per year till 2005. For a given year, the publications in peer review journals with Impact Factor were generally lower compared to the ones in peer review journals without Impact Factor (figures 12a; 12b). In 2012, except for the proceedings, the number of published scientific articles is lower compared to the last years (Figure 12a).

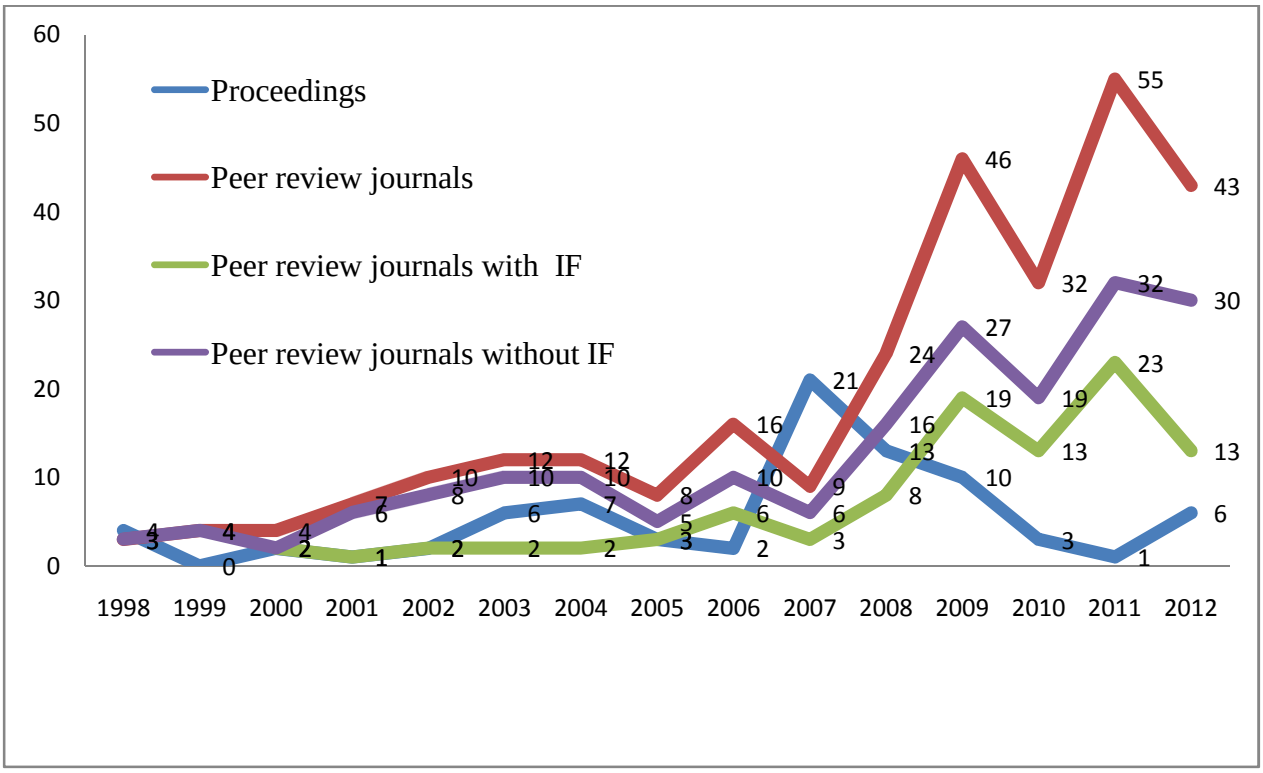

Figure 12 a: Trends per types of publications from 1998 to 2012

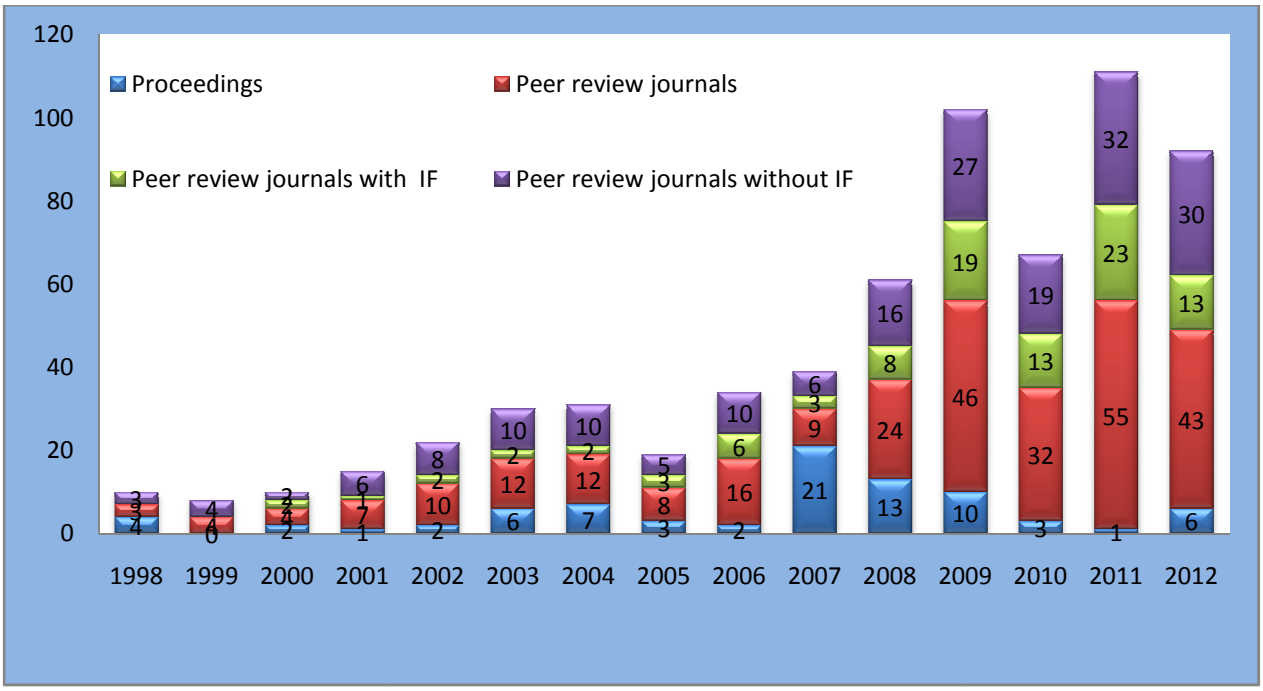

Figure 12b : Spectra of type of publications from 1998 to 2012: percentages of reviews

2.2.2.4 French/English ratio according to the types of publications

Except for dissertation reports in Agronomy and articles in peer journal without impact factor which were more written in French, Master sciences thesis, PhD thesis, articles in peer journal with impact factor and proceeding were most written in English (Figure 13). This would suggest that English is increasingly being adopted by scientists in LEA.

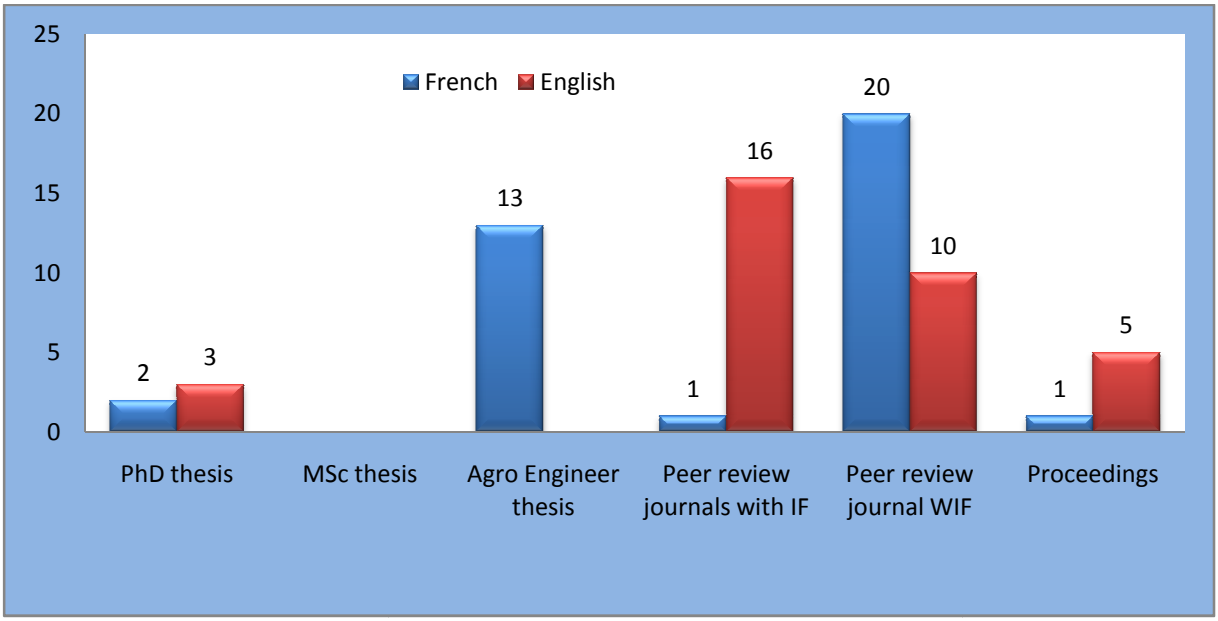

Figure 13: French/English ratio for various types of publications in LEA in 2012

2.2.2.5: Abstracts: number of publications and indexes of specialization

Twelve (12) abstracts were published in books of abstracts of scientific conferences in 2012. These abstracts were linked to various disciplines as illustrated in figure 14. Forest and Plant ecology, Wildlife and grassland, and risk assessment and climate change showed the highest index of publications (36 % and 23 %, 14 % respectively) followed by biometry (9 %), agriculture and agroforestry (9 %) and ethnobiology (9 %). Full references of these publications are shown in appendix 11.

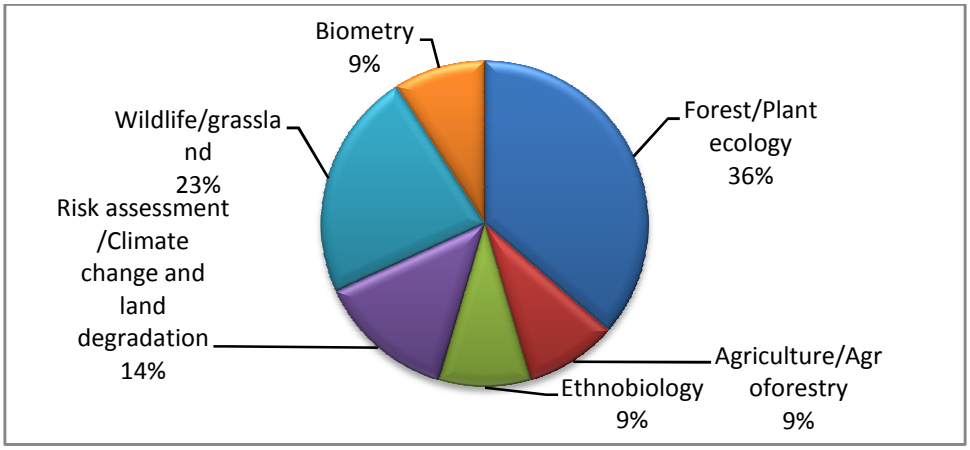

Figure 14: Indices of publications specialization in books of abstracts in 2012

3. Conferences and seminars in 2012

In 2012, researchers at LEA have participated in 43 conferences. 72 % of these conferences were held in Africa, 12 % in Europe, 8 % in Asia, 4 % in North America and 4 % in the USA (Figure 18). Details related to these conferences/workshops are listed in appendix 13. LEA has started internal seminars focusing on scientific information sharing in 2012. Eleven presentations were achieved in 2012 during the seminars. These seminars mainly addressed model in ecology and data analysis (8 presentations), quantitative ethno-botanic and the integration of socio-economic dimension in agro-ecological study and fundamental research questions still lacking in our research endeavours so far.

4. Research projects, research grants and prize at the LEA in 2012

The research activities undertaken by LEA were mainly funded by Local institution in Benin (INRAB, University of Abomey Calavi and Africa Union: 15%), European Union (UNDESERT, WANOART/ROAFRAB: 10 %), international co-operation projects (LOEWE, NUFFIC: 10 %), and international foundations and institutions (small research grants: 65 %) (Figure 16). WANOART is the only one project which has no PhD students. Most of the PhD and MSc students as well as senior scientists at LEA are involved in these projects for their research activities. Details (objectives, beneficiaries, etc.) on these projects and grants are described in appendixes 14 and 15. Moreover, two international recognitions have been awarded to the researchers from LEA in 2012 (appendix 16).

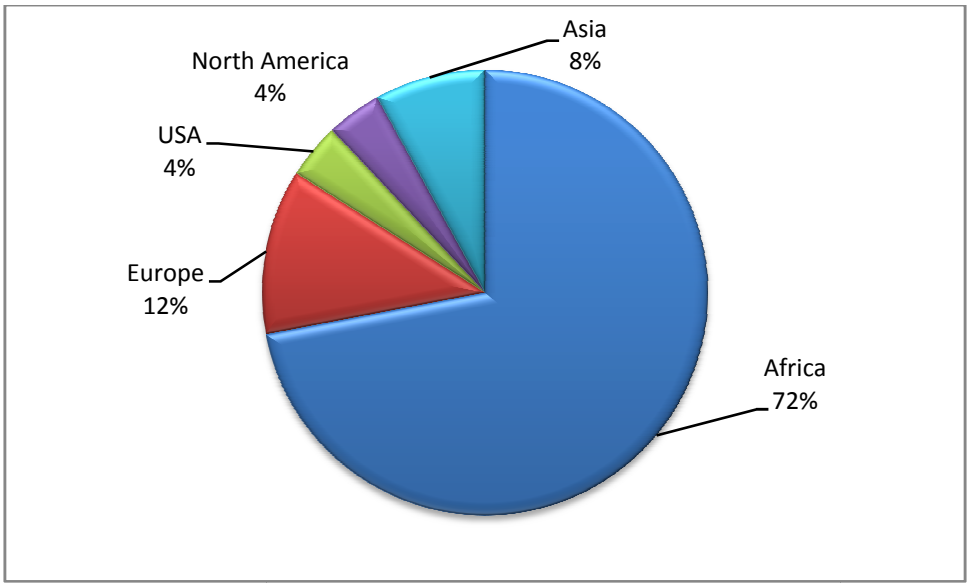

Figure 15 : Level of participation of LEA's researchers to international conferences in 2012

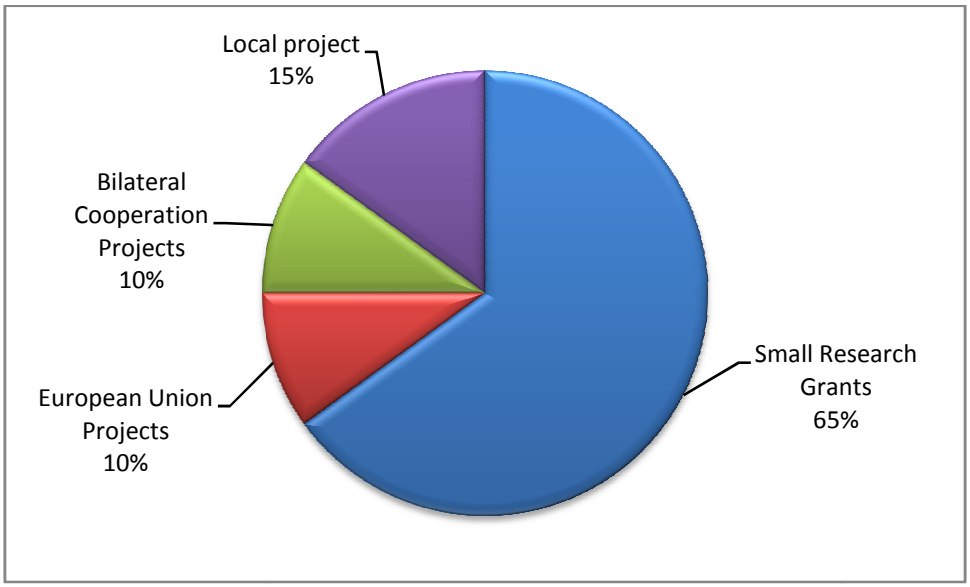

Figure 16: Spectrum of research funding in 2012

5. Human resources and visiting research in the LEA in 2012

Human resources in the LEA in 2012 are about 20 main investigators and senior scientists, 28 PhD students, 13 undergraduate students in Agronomy actively participating to research activities within the laboratory. Moreover, 5 technicians and 3 drivers are used on permanent basis for the fieldworks. Specifically, LEA houses one Full Professor (Professeur Titulaire CAMES), three associate Professor (Maitre-Conference/CAMES), three assistant Professor (Maître-Assistant/CAMES), several assistant (PhD) and junior researchers (MSc, MBa, Agricultural Engineer and bachelor students). Details about these human resources are shown on the web site of LEA (www.leabenin-fsauac.net).

Furthermore, in the course of the year 2012, LEA has welcomed 8 researchers as visitors vs. 69 in 2009, 63 in 2008 and 51 in 2007, (Figure 17).

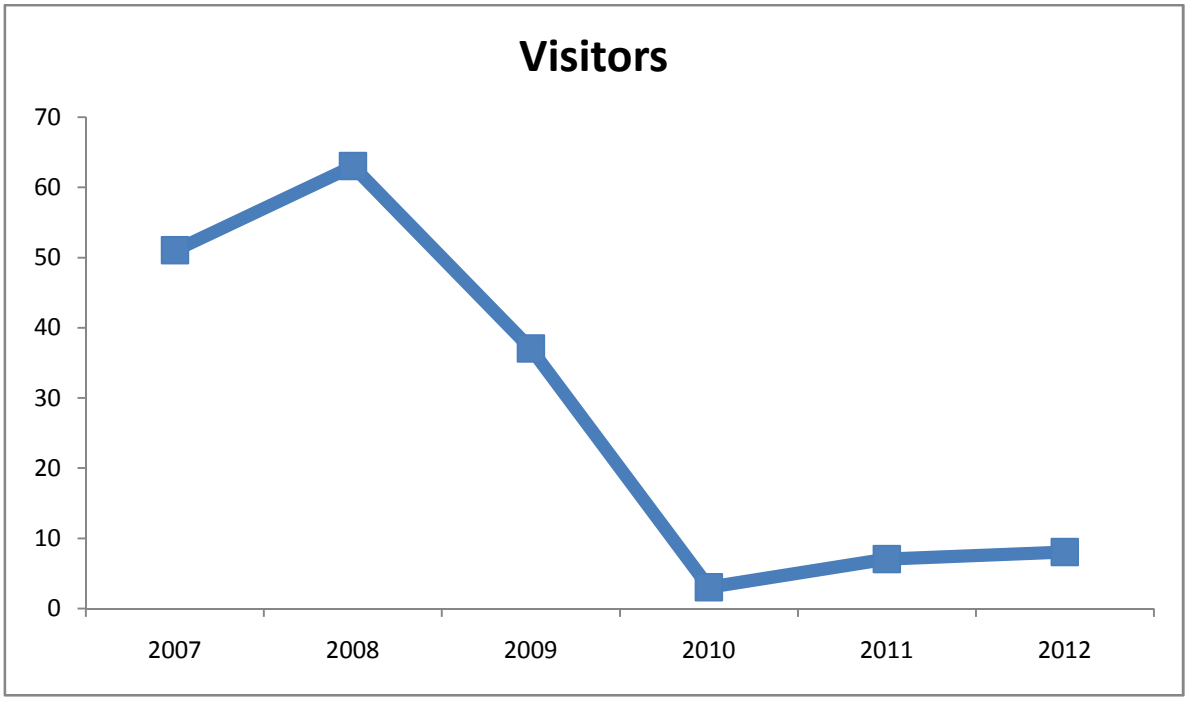

Figure 17 : Trends of visiting researchers welcomed in the LEA from 2007 to 2012

6. General discussion and conclusion

Various types of publications were produced by LEA's researchers in 2012 as it was the case in previous years. It is important to notice that even if the total number of published papers in peer review journal in 2012 is lower than the published papers in 2011, the global trend increase since 1998. The decreased of published papers in 2012 compared to 2011 could be explained by omission of individual reports of some researchers. Indeed some researchers who used to send their individual report did not send it on time. The global increase of published papers since 1998 in LEA can be explained by the increase of researchers holding a PhD and PhD student since 2006. The number of published articles in journals with Impact Factor has considerably increased since 2008.This means that researchers are improving their publication skills and the quality of their investigation. Another driver for this is the change in the requierements before defending a PhD thesis at the Faculty of Agronomic Scienc which hosts LEA (having at least two published original research paper). In the other hand, requirements for upgrading academics grades within the CAMES system *(Conseil Africain et Malgache pour l'Enseignement Supérieur*) is another important driver for increasing high quality papers within LEA. As such, the scientific capacity of LEA research teams is increasing. Published articles in 2012 were mostly produced in team at national (75 %). Published article in peer journal with impact factor were mostly co-written with international colleagues while published articles in peer journal without impact factor were morelikely writen by teams at national level. A reason for that could be the requierements for writing in English for original papers to be submitted in most impact factor journals. Field research such as ethnobiology, wildlife and grassland and forest plant ecology were the most to contribute to original research papers. This trend is expected to remain the same in 2013.

Publications which have highly contributed to gain the Impact Factor of the laboratory in 2012 were related to Agriculture and agroforestry followed by publications in Ethnobiology and Forest and Plant ecology (table 1). These disciplines are then the most important in terms of scientific impact of LEA in 2012.

To date, almost no scientific works was done with the scientists from Latino America, Australia, Middle East and even Northern Africa. This suggests the need of more and sustainable efforts for building cooperative research networks basically using interactive research topics and funds from these parts of the world. Moreover, since 2007, very few scientific papers have been published with scientists at a regional level. In 2012, 63.83 % of the articles have been co-published within national team while 25.53 % of them have been co-published with European scientists (41 %). As such, regional scientific collaborations should be developed for the following years since Benin shares with its neighboring countries similar research problems which need regional solutions and then should be solved regionally through research activities involving laboratories in the region.

Based on the findings from the present report, it is suggested that LEA:

(1) helps for capacity building among its research teams in order to be able to publish more scientific papers in peer review journals having a high IF;
(2) develops more research collaboration at regional level ;
(3) develop curricula in the fields of applied ecology for regional training purposes;
(4) continue monitoring biodiversity at continental level;

(6) develop conservation and domestication strategies for some edible and medicinal forest and savannahs resources;
(7) develop guidelines for fieldwork in applied ecology for para ecologists;
(8) monitor threatened and endangered plants and animals species at regional level.

7. References

- http://scientific.thomson.com/products/wos/
- www.leabenin-fsauac.net
- www.notesdecologie.bj.refer.org
- www.fsa.bj.refer.org

Publications in LEA in 2011-2012 (cf. appendices)

Proceedings in LEA in 2011-2012 (cf. appendices)

Theses in LEA in 2012 (cf. appendices: PhD, agronomist degree).

APPENDIXES

2012 SCIENTIFIC ACTIVITIES REPORT OF THE LABORATORY OF APPLIED ECOLOGY

Appendix 1: Ongoing PhD thesis in LEA

N°	Student full name	Number of year since the start of the PhD	Research topics	Fields of Research
1	Assede Emeline P.S.	5th year	Ecology of Plant community in Biosphere Reserve of Pendjari	*Plant ecology*
2	Azihou Akomian Fortuné	3th year	Ecology of isolated individuals of gregarious species in the tropics: modeling of plant species distribution and niche colonization based on the concept of dispersal	*Plant ecology*
3	Djagoun Chabi Adéyèmi Marc Sylvestre	3th year	Co-evolution of the feeding and foraging ecology of bovid species in the Pendjari Biosphere Reserve, Northern Benin.	*Wildlife ecology/ Protected areas management*
4	Djego-Djossou Sylvie	4th year	Aires d'occurrence et comportements socio-écologiques des colobes au Bénin	*Wildlife ecology/ Protected areas management*
5	Edon Aderomou Tinuadé Solange	5th year	Baobab regeneration in Benin	*Plant ecology*
6	Padonou Elie Antoine	2st year	Bowe occurrence patterns and their predictive extension above ground with respect to plant species diversification	*Desertification and land degradation*
7	Kombienou Pocoum Damè	2nd year	Impacts des systèmes agricoles et de l'occupation des terres en zone montagneuse de la chaîne de l'Atacora au Nord-Ouest du Bénin	*Plant ecology and management*
8	Houndantode Justin	5th year	Problématique de gestion et valorisation des eaux usées du Bénin en cultures maraîchères : cas de l'amarante dans la commune de Sème Kpodji.	*Horticulture & Environmental management*
9	Ahoudji Carmelle Myrèse	2nd year	Grasslands ecosystem functioning: patterns of establishment of dominant plant species, grass tussock growth, ecology and fire impacts on grassland dynamics	*Grassland ecology*
10	Nago Sèdjro Gilles Armel	7th year	Savannah amphibians along a disturbance gradient	*Wildlife ecology/Protected areas management*
11	Okou Farris Aurlus Yissegnon	2nd year	The Atacora mountain under the drivers of land use and their impacts on species establishment	*Desertification and land degradation*
12	Tossou Cocou Christophe	5th year	Dimensions socio économique et environnementale des espèces fruitières cultivées sur le Plateau d'Allada au sud du Bénin	*Non timber forest products*
13	Kpera Gnanki Nathalie	4th year	Human and crocodile interaction around agro-pastoral dams in Northern Bénin.	*Wildlife ecology/ Protected areas management*
14	Avakoudjo Julien	6 th year	Assessment of soil degradation : Process and resilience as mastered by aridity factors and land use practices inside and around the W National Park (Benin).	*Wildlife ecology/ Protected areas management*
15	Azizou El-Hadj Issa	8th year	Facteurs déterminants de cogestion pour la conservation des ressources naturelles de la réserve de biosphère transfrontalière du W/Bénin.	*Wildlife /protected areas management*
16	Toudonou A. S. Christian	6th year	Utilisation and conservation of snakes: case study from ball python (*Python regius*) in Benin.	*Wildlife /protected areas management*

17	Mama Djaouga	7th year	Mutations spatio-fonctionnelles des systèmes agropastoraux dans les communes de Kalalé-Nikki, Gogounou-Kandi au Nord-Est du Bénin: essai de cartographie et de modélisation.	*Wildlife /protected areas management*
18	Maliki Rafiou	6th year	Evaluation de la durabilité écologique et socio-économique des systèmes de cultures sédentarisés à base d'igname : Développement des modèles bio-économiques.	*Agroforestry/Non Timber Forest Products*
19	Agonyissa Didier	7th year	Species diversity variation in sudanian *Isoberlinia doka* and *Isoberlinia tomentosa* woodland in relation to plot sizes and landuse pressure in Benin.	*Plant ecology and management*
20	Agbani Onodjè Pierre	7th year	Etat de conservation et viabilité des populations de quelques espèces ligneuses soudaniennes menacées du Bénin.	*Plant ecology and management*
21	Sinsin C. A. Franck	5th year	Tree Ring Analysis; Population Structure and Sustainable Forest Management: Investigation of Selected Tropical Tree Species in Three Phytogeographical Regions of Benin.	*Plant ecology and management*
22	Houndantode Justin	6th year	Problématique de gestion et valorisation des eaux usées du Bénin en cultures maraîchères : cas de l'amarante dans la commune de Sème Kpodji.	*Horticulture & Environmental management*
23	Assongba Faustin	3rd year	Répartition Spatiale, Ecologie et Statut de conservation du tamarinier noir (Dialium guineense) Au Bénin	*Ecologie et Ethnobotanique*
24	Charlemagne Gbemavo	2nd year	Etude de la variabilité écologique et morphologique du pourghère (Jatropha curcas) au Bénin	*Plant sciences*
25	Sinasson Sanni Koupamba Gisèle	1st year	Distribution, structure and dynamics of Mimusops andongensis Hiern in Benin	*Plants ecology and conservation*

Appendix 2: Completed agronomist engineer & Master degree in 2012

N°	Student full name	Research topics	Fields of Research
1	KOURA Bossima Ivan	Système de production péri-urbain de bovins et stratégies d'alimentation sur la côte au sud-Bénin	Livestock production system
2	AGBAHOUNGBA S.	Caractéristiques Physico-chimiques, biologiques et usages agronomiques des bowés dans la zone de transition Soudano-guinéenne : cas de la commune de Zogbodomey.	Soil sciences
3	AHOSSOU O.D.	Etude comparative des coûts d'opportunité de différents types d'exploitation dans la forêt marécageuse de Lokoli et leur impact sur la dynamique des ressources exploitées.	Environmental economy
4	NOULEKOUN F.	Contribution des jardins de case à la conservation de la biodiversité biologique et bio-culturelle dans la zone Guinéo-Congolaise au Bénin.	Biodiversity and Conservation
5	SANNI M.	Jardins de case et conservation de la diversité biologique et bio-culturelle dans la zone soudanienne du Bénin.	Biodiversity and Conservation
6	ABDOU IBRAHIMA W.	Jardins de case et conservation de la diversité biologique et bio-culturelle dans la zone Soudano-Guinéenne au Bénin.	Biodiversity and Conservation
7	GOUSSANOU C. A.	Evaluation écologique et ethnobotanique de *Sarcocephalus latifolius* (Sm). E.A. Bruce (Rubiaceae) au Sud-Bénin.	Ethnobotany
8	DAVAKAN D.	Ethnobotanique, structure et régénération de *Barteria nigritiana* Hook.f.- subsp. *nigritiana* au Sud-Bénin.	Ethnobotany
9	SEBO VIFAND.G.M.A.A.	Connaissances ethnobotaniques et utilisation des organes des plantes dans la facilitation de l'accouchement des femmes dans la forêt classée de la Lama.	Ethnobotany
10	KINTONOU N.A.	Evaluation socio-économique et écologique de *Sarcocephalus latifolius* (Sm.) E.A. Bruce (Rubiaceae) au Sud Bénin.	Environmental economy
11	GUENDEHOUF.	Evaluation écologique et utilisation de *Zanthoxylum zanthoxyloides* Waterm. (Rutaceae) dans la Forêt Classée de la Lama.	Ethnobotany
12	IDOHOU R.F.	Biodiversité et prioritisation des parents sauvages de plantes cultivées.	Biodiversity and Conservation
13	VITOULE M.E.T.	Ecologie, Structure des populations et importance ethnobotanique de *Drypetes floribunda* (Müll.Arg.) Hutch. et de *Mimusops andongensis* Hiern. Dans la Forêt Classée de la Lama.	Ethnobotany

Appendix 3: Completed Doctorate thesis in 2012

N°	Student full name	Diploma (Doctor, PhD, etc.)	Research topics	Institution/Specialisation
1	Houehanou Thierry	Doctor	Ecological gap analysis: Assessing the ecological effectiveness of the Biosphere Reserve of Pendjari in biodiversity conservation in Benin (West Africa)	Faculté des Sciences Agronomiques/Aménagement et Gestion des Ressources Naturelles
2	Arouna Ousséni	Doctor	Mapping and predictive modelling of time-space changes of vegetation in the district of Djidja (Benin): lesson for regional planning	University of Abomey-Calavi, FLASH, Ecole Doctorale Pluridisciplinaire
3	Nobime Georges	Doctor	Les facteurs écologiques et éthologiques déterminants pour la conservation du cercopithèque à ventre rouge Cercopithecus e. erythrogaster au Bénin.	University of Abomey Calavi / FSA / AGRN
4	Sêwanoudé Scholastique Mireille Toyi Alagbe	Doctor	Analyse de l'impact de la diffusion du teck (Tectona grandis L.f.) sur la structure du paysage dans le Département de l'Atlantique (Sud-Bénin)	University of Abomey Calavi / FSA / AGRN
5	Romaric Vihotogbe	Doctor	Characterization of African Bush Mango trees with emphasis on the differences between sweet and bitter trees in the Dahomey Gap (West Africa)	Wageningen University/Biosystematique
6	Zoffoun Alex	Doctor	Etude de la diversité des communautés végétales envahissantes des cultures fourragères et de la dynamique de tallage des graminées vivaces des pâturages artificiels au Bénin.	University of Abomey Calavi / FSA / AGRN

Appendix 4: Articles published in peer-review journal with Impact Factor (IF) in 2012

Disciplines	N°	Authors' Names	Title of the article	Journals	Impact Factor
Environmental Chemistry and Toxicology	1	Martin Pépin Aina; François Paule Codo, Julien Adounkpe; Benjamin Yao ; Guy Matejka ; Yongxin Xu	Investigation of Leachate Quantity from a Solid Waste Landfill in a Mediterranean Climate	*European Journal of Scientific Research Vol. 74 No 3 (2012) pp 412-425*	1.2875
Phytosociology	2	Assédé Emeline P.S., Adomou Aristide C., Sinsin Brice	Secondary succession and factors determining change in soil condition from fallow to savannah in the Sudanian Zone of Benin	*Phytocoenologia* 42 (3 – 4), 181 – 189	0.697
Natural Resources Management	3	Assogbadjo Ae, Chadare Fj, Glèlè Kakaï R, Fandohan B, Baidu-Forson Jj	Variation in biochemical composition of baobab (Adansonia digitata) pulp, leaves and seeds in relation to soil types and tree provenances	*Agriculture, Ecosystems and Environment* 157 94–99	3.004
Plant-Insect Ecology	4	Fandohan B, Assogbadjo Ae, Salako Vk, Van Damme P, Sinsin B	Which one comes first, the tamarind or the Macrotermes termitarium?	*Acta Botanica Gallica 159:3 (2012): 345-355*	0.383
Ethno-Ecology	5	Cuni Sanchez A, Fandohan B, Assogbadjo A, Sinsin B	A countrywide multi-ethnic assessment of local communities' perception of climate change in Benin (West Africa)	*Climate and Development 4 (2) (2012): 114–128*	1.206
Forest Sciences	6	Fonton Nh, Atindogbe G, Fandohan B, Lejeune P, Ligot G	Structure spatial des arbres des savanes boisées et forêts claires soudaniennes : implication pour les enrichissements forestiers	*Biotechnology, Agronomy, Society and Environment 16(4) (2012):441-451*	0.454
Forest Sciences	7	Atindogbe G, Fonton Nh, Fandohan B, Lejeune P	Caractérisation des plantations privées de teck (Tectona grandis L.f.) du département de l'Atlantique au Sud-Bénin	*Biotechnology, Agronomy, Society and Environment 16(4) (2012):429-440*	0.454
Ecological Genetics	8	Assogbadjo Ae, Fandohan B, Glèlè Kakaï R, Kyndt T, Hardy Oj, Gheysen G, Sinsin B	Genetic evidence of the contribution of ethnic migrations to the propagation and persistence of the rare and declining scrambling shrub Caesalpinia bonduc L	*Human Ecology (2012) 40:117–128*	1.629
Ethnobotany-Agroforestry	9	Dadjo C, Assogbadjo Ae, Fandohan B, Glèlè Kakaï R, Chakeredza S, Houehanou Dt, Van Damme P, Sinsin B	Uses and Management of Black Plum (Vitex Doniana Sweet) In Southern Benin	*Fruits 67 (4) (2012 : 239–248.*	0.764
Etnobiology	10	Assogbadjo A.E., Glèlè Kakaï R., Vodouhê F.G., Djagoun C.A.M.S., Codjia J.T.C., Sinsin B.	Biodiversity and socioeconomic factors supporting farmers' choice of wild edible trees in the agroforestry systems of Benin (West Africa).	*Forest Policy and Economics. 14: 41–49.*	1.482
Ethnobotany	11	Laurent G Houessou, Toussaint O Lougbegnon, François Gh Gbesso, Lisette Es Anagonou And Brice Sinsin	Ethno-botanical study of the African star apple (Chrysophyllum albidum G. Don) in the Southern Benin (West Africa)	*Journal of Ethnobiology and Ethnomedicine 8:40*	2.390
Natural Resources Management	12	Oscar Teka , Ulrike Sturm-Hentschel , Joachim Vogt, Hans-Peter Bähr, Stefan Hinz, Brice Sinsin	Process analysis in the coastal zone of Benin through remote sensing and socio-economic surveys	*Ocean & Coastal Management (Elsevier)67 (2012) 87-100*	1.538
Interdisciplinary research	13	Kpéra, G.N., Aarts, N., Saïdou, A., Tossou, R.C., Eilers, C.H. A. M., Mensah, G.A., Sinsin, B.A., Kossou, D.K. & Van Der Zijpp, A.J.	Management of agro-pastoral dams in Benin: Stakeholders, institutions and rehabilitation research.	NJAS - Wageningen Journal of Life Sciences, 60–63, 79-90	0.980

Appendix 5: Articles published in peer-review journal without IF in 2012

Disciplines	**N°**	**Authors' Names**	**Title of the article**	**Journals**
Plant diversity	1	Assédé Emeline P.S., Adomou Aristide C., Sinsin Brice	Magnoliophyta, Biosphere Reserve of Pendjari, Atacora Province, Benin	*Check List 8(4): 642–661*
Population structure	2	Assédé Emeline P.S., Adomou Aristide C., Sinsin Brice	Relationship between stand regime and population structure of Pseudocedrela kotschyi (Meliaceae) and Terminalia macroptera (Combretaceae) in the Biosphere Reserve of Pendjari (Benin, West Africa)	*International Journal of Biodiversity and Conservation Vol. 4(12), pp. 427-438*
Etude d'impact environnemental	3	J. Djego, L. Djodjouwin & B. Sinsin	Impact et bénéfice de l'intégration des plantations dans le plan de zonage d'une aire protégée. Annales des Sciences Agronomiques, 16 (2) : 161-179. ISSN 1659-5009. (http:// www.ajol.info)	*Annales des Sciences Agronomiques16 (2) : 161-179, 2012 ISSN 1659-5009*
Ecologie	4	Julien Djego, Moussa Gibigaye, Brice Tente Et Brice Sinsin	Analyses écologique et structurale de la forêt communautaire de Kaodji au Bénin. Int. J. Biol. Chem. Sci. 6 (2): 705-713. ISSN 1991-8631 : (http://ajol.info/index.php/ijbcs)	*Int. J. Biol. Chem. Sci. 6(2): 705-713, April 2012*
Botanique et Ethnobotanique	5	Padonou Elie Antoine, Kindomihou Missiako Valentin, Djego Julien Gaudence, Sinsin Brice Augustin	Diversity of Medicinal Plants and Preliminary Parameterization of their Uses in Benin (Western Africa). 2 (4): 212-220. Online ISSN: 2223-1331 Print ISSN: 2226-5724; (http://www.aessweb.com/)	*Journal of Asian Scientific Research Vol.2, No.4, pp.212-220.*
Etnobotanique et Ethnopharmacologie	6	Aurel Constant Allabi, Richi Dossa, Julien Gaudence Djeigo, Jean-Cyr Yombi, Kouma Diombo, André Bigot And Priuli Giambattista	Effectiveness of the medicinal plant R019 in the treatment of HIV infection: an observational study. Journal of Applied Pharmaceutical Science 02 (02) : 59-65. (http://www.japsonline.com/)	*Journal of Applied Pharmaceutical Science 02 (02); 2012: 59-65*
Ethnozoologie	7	Djego-Djossou, M.C. Huynen, J. Djego & B. Sinsin	Croyances Traditionnelles et Conservation du Colobe de Geoffroy, Colobus vellerosus (Geoffroy, 1834), dans la Forêt Sacrée de Kikélé, Bénin (Afrique de l'Ouest). African Primates 7 (2): 193-202. ISSN 1093-8966. : African Primates e-journal (IUCN/SSC)	*African Primates 7 (2): 193-202 (2012)*
Biometry	8	Salako V., A Tinuke And Glele Kakaï R.	On The Empirical Performance Of Non-Metric Multidimensional Scaling In Vegetation Studies.	*International journal of applied mathematics and statistics 36(6):54-67*
Ecologie	9	Djodjouwin L., Glele Kakaï R., Sinsin B.	Effets des sols et du taux de recouvrement sur la morphologie des espèces introduites dans les galeries forestières en zone Soudano-Guinéenne au Bénin.	*Agronomie Africaine 24 (2) : 101 – 115.*
Ecologie	10	Djodjouwin L., Glele Kakaï R., Sinsin B.	Croissance morphologique de cinq essences locales introduites dans les formations forestières Guinéennes et Soudano-guinéennes au Bénin.	*Agronomie africaine 24 (2): 117 – 127.*
Economy	11	Gnanglè P.C., Yabi A. J., Yegbemey R.N., Glele Kakaï R.L., Sokpon N.	Rentabilité économique des systèmes de production des parcs à Karité dans le contexte de l'adaptation au changement climatique du Nord-Bénin.	*African Crop Science Journal, 20(2): 589-602.*
agriculture	12	Adjanohoun A., Noumavo P. A.,	Effets des rhizobactéries PGPR sur le rendement et les	*International Journal of Biological and Chemical*

Disciplines	N°	Authors' Names	Title of the article	Journals
		Sikirou R., Allagbe M., Gotoechan-Hodonou H., Dossa K. K., Yehouenou B., Glele Kakaï R., Baba-Moussa L.	teneurs en macroéléments du maïs sur sol ferralitique non dégradé au Sud-Bénin.	*Sciences 6(1): 279-288.*
Ethnobiologie	13	Gnangle P.C., Egah J., Baco M. N., Gbemavo C. D. S. J., Glele Kakaï R., Sokpon N.	Perceptions locales du changement climatique et mesures d'adaptation dans la gestion des parcs à karité au Nord-Bénin.	*International Journal of Biological and Chemical Sciences 6(1): 136-149.*
Phytodiversity conservation	14	Dossou M. Etienne, Lougbegnon O. Toussaint, Houessou G. Laurent, Teka S. Oscar, Tente A.H. Brice	Caractérisation phytoécologique et structurale des groupements végétaux de la forêt marécageuse d'Agonvè et de ses milieux connexes au Sud-Bénin	*Journal of Applied BioSciences 53: 3821 – 3830*
Ethnobotany	15	Dossou Me, Houessou Gl, Lougbegnon Ot , Tenté Ahb, Codjia Jtc	Etude ethnobotanique des ressources forestières ligneuses de la forêt marécageuse d'Agonvè et terroirs connexes au Bénin	*Tropicultura 30 (1) 41-48*
Grassland management	16	Laurent G. Houessou, Oscar Teka, Madjidou Oumorou, Brice Sinsin	Hemicryptophytes plant species as indicator of grassland state in semi-arid region: case study of W Biosphere Reserve and its surroundings area in Benin (West Africa)	*International Journal of Biological and Chemical Sciences 6(3): 1271-1280*
Fauna management	17	Yabi Biaou Francis, Lougbegnon O. Toussaint, Houessou G. Laurent	Distribution de l'avifaune urbaine de la ville d'Abomey-Calavi en relation avec quelques facteurs écologiques	*Journal de la Recherche Scientifique de l'Université de Lomé*
Grassland management	18	Lougbegnon O.T, Dossou Etienne, Houessou G.L, Teka O	Etude de base pour l'aménagement des terres de parcours dans la Commune de Malanville, en zone soudanienne du Bénin.	*Revue de Géographie de l'Université de Ouagadougou N°00- octobre 2012*
Fauna management	19	Lougbegnon O. Toussaint, Dossou M. Etienne, Houessou G. Laurent, Teka Oscar	Diversité des mammifères sauvages de la forêt marécageuse d'Agonvè et des zones connexes et déterminants socio-économiques de leur exploitation	*Revue de géographie du laboratoire Leïdi*
Climate change	20	Oscar Teka, Gbenato Laurent Houessou, Madjidou Oumorou, Vogt Joachim And Brice Sinsin	Assessment of Climate Variation Risks on Agricultural Production: Perceptions and Adaptation Options in Benin	*International Journal of Climate Change Strategies Management (Emerald)*
Animal production	21	Jonas André Djenontin, Oumorou Madjidou, Marcel Romuald Houinato, Guy Apollinaire Mensah, Brice Augustin Sinsin	Le calendrier pastoral en élevage extensif dans le Nord-Est du Bénin : un outil de gestion du cheptel bovin de l'exploitation.	*Sécheresse. Volume 23, Numéro 4, 261-70*
Animal production	22	Adjolohouns., Dahouda M., Adandedjan C., Seibou Toléba S., Houinato M., Nonfon R. Et Sinsin B.	Diversité et caractérisation morphologique des écotypes de l'espèce fourragère Panicum maximum au Bénin	*Int. J. Biol. Chem. Sci., 6(5): 2043-2054.*
Animal production	23	Aboha. B., Babatounde S., Oumorou M., Houinato M. Et Brice Sinsin	Valeur pastorale des parcours naturels en zone soudano-guinéenne et stratégie paysanne d'adaptation aux effets de leur invasion par Chromolaena odorata au Bénin.	*Int. J. Biol. Chem. Sci. 6(4): 1633-1646.*

Disciplines	N°	Authors' Names	Title of the article	Journals
Animal production	24	Ayssiwede S. B., Missoko-Mabeki R., Mankor A., Dieng A., Houinato M. R. B., Chrysostome C. A. A. M., Dahouda M., Missohou A. Et Hornickj. L.	Effets de l'incorporation de la farine de feuilles de Cassia tora (Linn.) dans la ration alimentaire de jeunes poulets traditionnels du Sénégal	*Revue Méd. Vét.,163, 8-9, 375-386*
Socioeconomics	25	Houngbo, N. E.; Mongbo, R.; Homevo Agossa, C.; Djego, J.: Kindomihou, V.; Floquet, A. & Sinsin, B.	Genre et pauvreté chronique en milieu rural au Bénin	*Les Cahiers du CBRST 2 : 147-165*
Environment Rural Sociology	26	Houédjissin R. C., Zoffoun G. A., Djènontin A. J. Et Boko M	Perceptions paysannes des changements climatiques et des mutations socio-économiques dans la commune rurale d'Agbangnizoun.	*Revue "Climat et Développement" Laboratoire Pierre Pagney : Climat, Eau, Ecosystèmes et Développement (LACEEDE) / Université d'Abomey-Calavi*
Animal Husbandry Rural Sociology	27	J. C. Hinvi, A. J. P. Djènontin, A. G. Zoffoun Et G. A. Mensah	Adoption ex-ante du fumier de parc au Nord-Bénin	*Bulletin de la Recherche Agronomique du Bénin (BRAB). Numéro spécial Agriculture & Forêt - Novembre 2012, pp 18-27. ISSN 1840-7099. Oon line http://www.slire.net .*
Environmental Chemistry and Toxicology	28	Martin Pépin Aina, Julien Adounkpe, Daouda Mama, Waris Chouti, Mansourou Moudachirou, Guy Matejka	Evaluation of Flow of Waste Electrical and Electronic Equipment in Benin	*British Journal of Science 11 June 2012, Vol. 5 (2)*
Plant nutrition and soil science	29	Dagbénonbakin G.D., Agbangba E.C., Kindomihou V.	A preliminary DRIS model parameters for mineral nutrition assessment of groundnut (Arachis hypogaea L.) in Benin (West Africa).	*Annales de l'Université de Parakou, Série "Sciences Naturelles – Agronomie" 2 (2): 71-91. (2012) ISBN/ISSN: 678-99919-62-55-9.*
Plant ecophysiology	30	Kindomihou M.V., Holou A.Y.R., Dagbénonbakin D.G., Sinsin B.A., Meerts P.J. 2012	Temporal change in silica accumulation, covariations with foliar minerals and fodder value of Loxodera ledermannii (Pilger) ex Launert from the sudanian Benin (Western Africa).	*International Journal of Academic Research, Natural and Applied Sciences 4(3): 144-152. DOI: 10.7813/2075-4124.2012. Print ISSN: 2075-4124. E-ISSN:2075-7107.*

Appendix 6: Articles in press in peer-review journal with IFin 2012

Disciplines	N°	Authors' Names	Title of the article	Journals	Impact Factor
Plant ecology	1	Chabi A. M. S. Djagoun, Bruno A. Djossa, Guy. A. Mensah, Brice A. Sinsin	Vigilance efficiency and behaviour of Bohor reedbuck Redunca redunca (Pallas 1767) in a savanna environment of Pendjari Biosphere Reserve (Northern Benin)	*Mammal Study*	0.581
Forest Sciences and Plant community Ecology	2	Houéto G, Fandohan B, Ouédraogo A, Ago E, Salako VK, Assogbadjo AE, Glèlè Kakaï R, Sinsin B	Floristic and dendrometric analysis of woodlands in the Sudano-Guinean zone: a case study of Belléfoungou forest reserve in Benin	*Acta Botanica Gallica*	0.383
Natural Resources Management	3	Idohou R, Assogbadjo AE, Fandohan B, Gouwakinnou GN, Glele Kakai RL, Sinsin B, Maxted N	National Inventory and Prioritization of Crop Wild Relatives: case study for Benin	*Genetic Resources and Crop Evolution*	1.554
Forest ecology	6	Akomian Fortuné Azihou, Romain Glèlè Kakaï, Ronald Bellefontaine and Brice Sinsin	Distribution of tree species along a gallery forest–savanna gradient: patterns, overlaps and ecological thresholds	*Journal of Tropical Ecology*	1.401
Ethnopharmacology & Ethnomedicine	7	Marius H. Yetein, Laurent G. Houessou, Toussaint O. Lougbegnon, Oscar Teka, Brice Tente	Ethnobotanical study of medicinal plants used for the treatment of malaria in plateau of Allada, Benin (West Africa)	*Journal of Ethnopharmacology (2012), http://dx.doi.org/10.1016/j.jep.2012.12.022i*	3.014
Desertification and Land Degradation	8	Elie A. Padonou, Achille E. Assogbadjo, Yvonne Bachmannand Brice Sinsin	How far bowalization affects phytodiversity, life forms and plant morphology in Sub-humid tropic in West Africa	*African Journal of Ecology*	0.68
Conservation, biology	9	Thierry D. Houehanou, Valentin Kindomihou, Tariq Stevart, Brice Tente, Marcel Houinato & Brice Sinsin	Variation of Loranthaceae impact on Vitellaria paradoxa C. F. Gaertn. fruit yield in contrasting habitats and implication for its conservation	*Fruits*	0.7
Conservation biology, Ecology	10	Thierry D. Houehanou, Achille E. Assogbadjo, Romain Glele Kakaï, Tina Kyndt, Marcel Houinato, Brice Sinsin	How far a protected area contributes to conserve habitat species composition and population structure of endangered African tree species (Benin, West Africa)	*Ecological Complexity*	1.9
Plant ecophysiology	11	Kindomihou M. V., Adjolohoun S., Holou Y.A. R. , Sinsin B. A., Meerts P.J.	The effect of seasonal variations, covariations with minerals and forage value on Itchgrass [Rottboellia cochinchinensis (Lour.) W.D. Clayton]' foliar silicification from sudanian Benin	*Journal of Life Sciences (2012). ISSN: 1934 - 7391.*	3.30
Agronomy	12	Vihotogbé R, Glèlè Kakaï R, van Andel T, Berg RG van den, Sinsin B, Sosef MSM	Backgrounds of the domestication process of African Bush Mango Trees (Irvingiaceae) in the Dahomey Gap (West Africa).	*Plant Ecology and Evolution*	1.167
Genetics	13	Vihotogbé R, van Ben Berg RG, Missihoun AA, Agbangla C, Sinsin B, Sosef MSM	Genetic diversity and difference within and between bitter and sweet African bush mango trees (Irvingia spp., Irvingiaceae) in West and Central Africa.	*African Journal of Biotechnology.*	0.791
Agronomy	14	Vihotogbé R, Berg RG van den, Sosef MSM (2013)	Morphological Characterization of African Bush Mango Trees (Irvingia species) in the Dahomey Gap (West Africa)	*Genetic Resources and Crop Evolution. DOI 10.1007/s10722-013-9969-0.*	1.55
Forest ecology	15	Houehanou T., Glèlè Kakaï R., Assogbadjo A., Kindomihou V., Houinato M., Wittig R., Sinsin B.	Change in the woody floristic composition, diversity and structure from protected to unprotected savannas in Pendjari Biosphere Reserve (Benin, West Africa).	*African journal of ecology DOI: 10.1111/aje.12046*	0.68

Appendix 7: Articles in press in peer-review journal without IF in 2012

Disciplines	N°	Authors' Names	Title of the article	Journals
	1	Ph. Baah, A. Adebanji, R. Glèlè Kakaï	Optimal Ratio of Continuous to Categorical Variables for the Two Group Location Model	*International journal of applied mathematics and statistics*
Wildlife ecology	2	S. B. Ayssiwede, A. Dieng, M. R. B. Houinato, C. A. A. M. Chrysostome, Y. Issa, J. L. Hornick Et A. Missohou	Elevage des poulets traditionnels (ou indigènes) au Sénégal et en Afrique Subsaharienne : Etat des lieux et contraintes	*Annales de Médecine Vétérinaire*
Socio-Economics	3	Emile N. Houngbo; Julien G. Djego; Vincent Orekan; Toussaint Lougbégnon; Roch Mongbo & Brice Sinsin	Could Sacredness Contribute to Forestry Biodiversity Conservation in African Urban Areas?	*Annales des Sciences Agronomiques*
Desertification and Land Degradation	4	Elie A. Padonou1, Belarmain Fandohan, Yvonne Bachmann, Brice Sinsin	How farmers perceive and cope with bowalization: a case study from West Africa (Benin)	*Annale des Sciences Agronomiques*
Natural Resources Management	5	Teka O., Houessou G. L., Lougbegnon T., Oumorou M. And Sinsin B.	Mangrove Degradation and Endogenous Strategies for Participatory Restoration and Conservation in Benin	*Journal of Sustainable Development*
Landscape ecology	6	Toyi S.S.M., Barima S. Y. S., Mama A., Andre M., Bastin J-F., De Cannière C., Sinsin B. & Bogaert J.	Tree plantation will not compensate natural woody vegetation cover loss in the Atlantic Department of southern Benin	*Tropicultura*
Landscape ecology	7	Toyi S.S.M., Bastin J-F., André M., De Cannière C., Sinsin B. & Bogaert J.	Influence de la lisière sur la productivité du teck (Tectona grandis L .f) : étude de cas des teckeraies privées du sud-Bénin	*Tropicultura*
Zootechnie	8	Philippe M.A.B.A., Tobada P., Aboh A.B.,Pomalègni S.C.B., Mensah S.E.P., Kpéra G.N., S. Farougou Et Mensah G.A.	Efficacité de Jatropha multifida dans le traitement des blessures externes des aulacodes (Thryonomys swinderianus) d'élevage	*Bulletin de la Recherche Agronomique du Bénin (BRAB) Numéro spécial Elevages de gibier et non gibier – Mai 2012* *BRAB en ligne (on line) sur le site web http://www.slire.net* *ISSN sur papier (on hard copy) : 1025-2355 et ISSN en ligne (on line) : 1840-7099*

Appendix 8: Articles under review in peer-review journal with IF in 2012

Disciplines	**N°**	**Authors' Names**	**Title of the article**	**Journals**	**Impact Factor**
Ecology	1	Gerard Nounagnon Gouwakinnou, Barthelemy Kassa, Valentin Kindomihou, Achille Ephrem Assogbadjo, Brice Sinsin	Using niche models to inform conservation of an indigenous fruit tree species (Sclerocarya birrea) under changing climate in Benin (West Africa)	*African Journal of Ecology*	0.655
Ecology	2	Rodrigue Idohou, Sylvestre Chabi Djagoun, Achille Ephrem Assogbadjo, Jean T. Claude Codjia	Soil And Environmental Factors Affecting Habitat Selection Of The Land Snail Species In Different Forest Habitats Of Dassa-Zoumé District (Central Benin)	*Molluscan Research ISSN: 1323-5818*	0.906
Desertification and land degradation	3	Elie A. Padonou, Yvonne Bachmann, Romain Glèlè Kakaï1, Brice Sinsin	Spatial distribution of bowal and differences in physicochemical characteristics between bowal and forest in the context of restoration in Benin,West Africa	*Land Degradation and Development*	1.25
Ecology	4	Boya André ABOH, Oscar TEKA, Madjidou OUMOROU and Brice SINSIN	Topographic and edaphic factors determining Chromolaena odorata and Hyptis suaveolens invasion of grassland in the Guineo-Congolian/ Sudanian transition zone (Benin)	*African Journal of Ecology*	0.655
Environmental Biology	5	Kindomihou M.V., Glele Kakai R.L., Assogbadjo A.E., Holou R.A.Y., Sinsin B.A.	Environmentally induced variation in germination percentage and energy of naked caryopses of Loxodera ledermannii (Pilger) W.D. Clayton ex Launert in subhumid Benin (West Africa)	*Advances in Environmental Biology http://www.aensiweb.com/aeb.html*	0.142
Interdisciplinary research	6	Kpéra G.N., Tossou R.C, Aarts N., Mensah, G.A., Kossou D.K. A., Sinsin, B.A., & van der Zijpp, A.J.	How institutions shape human-crocodile interactions: a framing analysis for improving agro-pastoral dam management in northern Benin	*International Journal of Agricultural Sustainability (IJAS)*	1.696
Interdisciplinary research	7	Kpéra G.N., Mensah, G.A., Tossou R.C, Aarts N., Sinsin, B.A. & van der Zijpp, A.J.	Crocodile habitat use: living with crocodiles for better use and management of agro-pastoral dams in northern Benin	*Ecology and society*	3.310
Ecology	8	Vihotogbé R, Raes N, van den Berg RG, Sinsin B, Sosef MSM	Ecological differences between African Bush Mango Trees with emphasis on the Dahomey Gap (West Africa)	*Tropical Plant Biology*	1.297

Appendix 9: Articles under review in peer-review journal without IF in 2012

Disciplines	N°	Authors' Names	Title of the article	Journals
Plant ecology	1	Assede, E.S. P., Glèlè Kakaï, R., Sinsin, B.	Effect of stand regime on the population structure of *Pseudocedrela kotschyi* (Meliaceae) and *Terminalia macroptera* (Combretaceae) in the Biosphere Reserve of Pendjari (Benin, West Africa)	*Flora Zambesiaca*
Socioeconomics	2	Houngbo, N. Emile; Hamadou Daouda, Youssoufou; Mongbo, Roch & Sinsin, Brice	Contribution de la croissance économique à la réduction de la pauvreté en milieu rural au Bénin (Afrique de l'Ouest)	*Annales des Sciences Agronomiques*
Forest and plant ecology	3	Gaston Akouehou, Cédric A. Goussanou, Rodrigue Idohou	Ethnobotanique et Importance socioculturelle de Artocarpus altilis (Parkinson) Fosberg (arbre à pain) au Sud-Bénin	*Annales des Sciences Agronomiques*
Agronomy	4	Vihotogbé R, Houessou LG, Assogbadjo AE, Sinsin B	Germination of seeds from earlier fruits of African bush mango in the Dahomey Gap (West Africa).	*International Journal of Biological and Chemical Sciences.*

Appendix 10: Publications in proceedings in 2012

Field of research	N°	Authors' Name	Title	Full References
Socioeconomics	1	N. Emile, Houngbo; Antoine, Chikou; Roch, Mongbo & Brice, Sinsin	Caractérisation de l'agressivité des populations vis-à-vis du lamantin (Trichechus senegalensis) dans la zone côtière du Bénin	Actes du Troisième Colloque des Sciences, Cultures et Technologies de l'UAC-Bénin, Volume III (Sciences naturelles et agronomiques), Akassato, Bénin, Juin 2011
Agricultural Economics	2	Emile N. Houngbo	Constraints to Smallholder Investments in Africa	Global Forum on Food Security and Nutrition, Discussion No. 79 of the High Level Panel of Experts, FAO Committee on World Food Security, Rome, Italy, May 2012
Agricultural Economics	3	Emile N. Houngbo	Agricultural Cooperatives in the African Context: Relevance and Conditions	Global Forum on Food Security and Nutrition, Discussion No. 82 of the High Level Panel of Experts, FAO Committee on World Food Security, Rome, Italy, July-August 2012
Agricultural Economics	4	Emile N. Houngbo	How Could Agriculture Contribute to Nutrition In Africa?	Global Forum on Food Security and Nutrition, Discussion No. 83 of the High Level Panel of Experts, FAO Committee on World Food Security, Rome, Italy, September-October 2012
Transborder Biosphere Reserve in W (benin)	5	Myrèse C. Ahoudji1, Oscar.Teka1*, Jorgen. Axelsen2, Marcel. Houinato1	Current floristic composition, life form and productivity of the grasslands in the Hunting Zone of Djona (Benin)	1Faculty of Agronomic Sciences, University of Abomey-Calavi, 01 BP 526, Cotonou, Benin 2National Environmental Research Institute, Aarhus University, Vejlsøvej 25, 8600 Silkeborg, Denmark *Corresponding author: myresea86@yahoo.fr
Transborder Biosphere Reserve in W (benin)	6	Myrèse Ahoudji1*, Roel Houdanon1, Belarmain Fandohan1, 2, Oscar Tèka1, Marcel Houinato1, Jorgen Axelsen3, Brice Sinsin1	Contribution to efforts to protect the Transboundary Biosphere Reserve in the vegetation dynamics	1Laboratoire d'Ecologie Appliquée, Faculté des Sciences Agronomiques, Université d'Abomey-Calavi, 01 BP 526, Cotonou, Benin. 2International Ecosystem Management Partnership (IEMP), United Nations Environment Programme, c/o Institute of Geography and Natural Resources Research, Chinese Academy of Sciences, No. 11A Datun Rd. Beijing 100101, China, Tel: +86 13641274143. 3National Environmental Research Institute, Aarhus University, Vejlsøvej 25, 8600 Silkeborg, Denmark *Corresponding author: myresea86@yahoo.fr

Appendix 11: Abstracts in books of abstracts in 2012

Field of research	N°	Authors' Name	Title	Full References
Population structure	1	Assédé Emeline P.S., Adomou Aristide C., Sinsin Brice	Effect of stand regime on the population structure of Pseudocedrela kotschyi (Meliaceae) and Terminalia macroptera (Combretaceae) in the Biosphere Reserve of Pendjari (Benin, West Africa)	IUFRO 2012. Forests and Trees: Serving the people of Africa and the world. IUFRO-FORNESSA Regional Congress & ITTO/AFF Forest Policy Day. 25-29 June 2012. Nairobi, Kenya. p. 43.
Wildlife ecology/ Protected areas	2	Djagoun C.A.M.S., B. Djossa, T. Coulson And B. Sinsin	Factors predicting habitat selection of bovid species in a resource-stressed environment of Pendjari Biosphere Reserve (Northern Benin)	Djagoun C.A.M.S., B. Djossa, T. Coulson and B. Sinsin. 2012. Factors predicting habitat selection of bovid species in a resource-stressed environment of Pendjari Biosphere Reserve (Northern Benin). Book of Abstract/IUFRO-FORNESSA Regional Congress & ITTO/AFF Forest Policy Day 25-29 June 2012. Nairobi, Kenya. pp:147.
Wildlife conservation/Ethnozoology and ethnobiology	3	Djagoun C.A.M.S., H.A. Akpona, G.A. Mensah, C. Nuttman, B. Sinsin	Wild mammals trade for zootherapeutic and mythic purposes in Benin (West Africa): capitalizing species involved, provision sources and implications for conservation	Djagoun C.A.M.S., H.A. Akpona, G.A. Mensah, C. Nuttman, B. Sinsin. 2012. Wild mammals trade for zootherapeutic and mythic purposes in Benin (West Africa): capitalizing species involved, provision sources and implications for conservation. Book of Abstract/IUFRO-FORNESSA Regional Congress & ITTO/AFF Forest Policy Day 25-29 June 2012. Nairobi, Kenya. pp:158.
Ethnobotanique	4	Djego J., Hounkpatin N., Gansou M., Bassene E. & Sinsin B.,	Contribution à la phytothérapie des troubles psychiatriques au Bénin.	Recueil des résumés des communications scientifiques du 17e Colloque sur la Pharmacopée et la médecine traditionnelles africaines (PMTA), tenu à Ndjaména au Tchad du 10 - 13 décembre 2012. P.55.
Ethnobotanique et Ethnopharmacologie	5	Djego J., Mouzouvi, Sehonou J., Laleye A., Priuli F., Bigot A,	Efficacité thérapeutique de l'association Combretum micranthum G. Don (Combretaceae) et Cochlospermum tinctorium A. Rich. (Cochlospermaceae) dans la prise en charge des hépatites virales B.	Recueil des résumés des communications scientifiques du 17e Colloque sur la Pharmacopée et la médecine traditionnelles africaines (PMTA), tenu à Ndjaména au Tchad du 10 - 13 décembre 2012. P.55.
Ecologie et Ethnobotanique	6	Assongba Y. Faustin., Djego G. Julien., Bio Anselme., Sinsin Brice	Importance Socioculturelle et distribution de Dialium guineense dans la Forêt classée de Wari-Maro	Programme & Résumés du Colloque International Sur l'Environnement : « Environnement, Urbanisation et Ruralité dans la région des Grands Lacs d'Afrique : Quels défis? Quelles solutions?» tenu du 8-10 novembre 2012 à Université du Burundi, à Bujumbura. P.39.
Ecologie	7	F. Assongba., G. J.Djego., P.Yedomonhan., Adomou A	Ecologie et distribution de Dialium guineense dans les phytodistricts Est du Sud-Bénin.	Programme & Résumés du Colloque International Sur l'Environnement : "Environnement, Urbanisation et Ruralité dans la région des Grands Lacs d'Afrique : Quels défis? Quelles solutions?" tenu du 8-10 novembre 2012 à Université du Burundi, à Bujumbura. P.33.
Forest ecology	8	Azihou A. F. & Sinsin B.	Utility of ecological thresholds in biodiversity conservation: insights from tree species distribution at gallery forest and savannah boundary	Azihou A. F. & Sinsin B., 2012. Utility of ecological thresholds in biodiversity conservation: insights from tree species distribution at gallery forest and savannah boundary. Books of abstracts. IUFRO-FORNESSA Regional Congress &

Field of research	N°	Authors' Name	Title	Full References
				ITTO/AFF Forest Policy Day – Forests and trees: serving the people of Africa and the World, 25 – 29 June 2012, Nairobi, Kenya. pp: 87.
Forest ecology	9	Gerard N. Gouwakinnou, Valentin Kindomihou, Adjima Thiombiano, Brice Sinsin	Regional variation in ecological characteristics and implications for habitat suitability models for Sclerocarya birrea subsp. birrea (Anacardiaceae) in African savanna	First IUFRO-FORNESSA Regional Congress, 25 – 30 June 2012 Nairobi, Kenya
Forest ecology	10	Gerard N. Gouwakinnou, Maxime Madou, And Brice Sinsin	Conservation status, knowledge and use of Prosopis africana in the W Biosphere reserve in Benin	First IUFRO-FORNESSA Regional Congress, 25 – 30 June 2012 Nairobi, Kenya
Forest ecology	11	Gerard N. Gouwakinnou, Oscar Eyog-Matig, Brice Sinsin	Pollination pattern, flowering phenology, and pollinator species of Sclerocarya birrea subsp. birrea in Benin, West Africa	Symposium à l'Hommage du Professeur Emérite Edouard ADJANOHOUN, Université d'Abomay-Calavi, du 26 au 28 Septembre 2012,
Pastoralism and rangland	12	Dodji Paolo A. Armel Lesse, Vincent Orekan, A. Jonas Djenontin, Marcel Houinato	Analysis of the Pastoral Management and the Adaptation of the Breeder Transhumants Facing the Climatic Fluctuation in the Administrative District Bording the Park W (Benin)	Tropentag 2012 International Research on Food Security, Natural Resource Management and Rural Development Resilience of agricultural systems against crises Book of abstracts ISBN: 978-3-95404-215-9
Agricultural Economics	13	Emile N. Houngbo & Valentin M. Kindomihou	Situation of Organic Agriculture in Benin Republic	Organic Certification Workshop organized by the West African Network for Organic Agriculture Research and Training (WANOART), Abomey-Calavi, Benin, December 2012
Desertification and land degradation	14	Elie A. Padonou, Achille E. Assogbadjo, Yvonne Bachmannand Brice Sinsin	How far bowalization affects phytodiversity, life forms and plant morphology in Sub-humid tropic in West Africa	Programme & Résumés Symposium en Hommage au Professeur Emerite Edouard Adjanohoun (26-28. 09. 2012), UAC. Benin
Desertification and land degradation	15	Elie A. Padonou, Belarmain Fandohan, Yvonne Bachmann, Brice Sinsin	How farmers perceive and cope with bowalization: a case study from West Africa (Benin)	Programme & Résumés Symposium en Hommage au Professeur Emerite Edouard Adjanohoun (26-28. 09. 2012), UAC. Benin
Desertification and land degradation	16	Elie A. Padonou, Belarmain Fandohan, Yvonne Bachmann, Brice Sinsin	How farmers perceive and cope with bowalization: a case study from West Africa (Benin)	Programme &Résumés du XVème édition des Journées Scientifiques Internationales de l'Université de Lomé (Togo) du 22 au 26 octobre 2012
Applied statistics and forestry	17	Salako K. Valere, Romain Glele Kakai	''Efficiency of inventory plots patterns in the structural analysis of woody vegetation: a dense semi-deciduous' study case for Benin''	1. Salako K. Valere, Romain Glele Kakai 2012. Efficiency of inventory plots patterns in the structural analysis of woody vegetation: a dense semi-deciduous' study case for Benin. In Journées Scientifiques Internationales de Lomé

Field of research	N°	Authors' Name	Title	Full References
				(eds), Les défis majeurs de l'Afrique et de la science au XXIe siècle : pénurie d'énergie, perturbations environnementales et changements climatiques. JSIL 15 :169.
Applied statistics and forestry	18	Salako K. Valere, Romain Glele Kakai	Relative performance of non-metric multidimensional scaling in vegetation studies: application to the lama forest reserve (Benin)	Salako K. Valere, Romain Glele Kakai 2012. Relative performance of non-metric multidimensional scaling in vegetation studies: application to the lama forest reserve. In Journées Scientifiques Internationales de Lomé (eds), Les défis majeurs de l'Afrique et de la science au XXIe siècle : pénurie d'énergie, perturbations environnementales et changements climatiques, JSIL 15 : 170.
Natural Resources Management	19	Gisèle K. S. Sinasson, Armand I. S. Yêvidé, Jean C. Ganglo, Armand Natta, Charles De Cannière, Jean-Louis Devineau & Bruno De Foucault	Ecology and structure of private teak plantations (Tectona grandis L.f) in southern-Benin: case of the municipality of Abomey-Calavi	In: Kenya Forestry Research Institute (eds). Forests and Trees: serving the people of Africa and the World. IUFRO-FORNESSA Regional Congress, Nairobi. Pp 6.
Crop and Pasture sciences	20	Adjolohoun S., Kindomihou V., Adandedjan C., Houinato M., Soumanou T., Nonfon W. R., Sinsin B.	Comparison of Stylosanthes fruticosa (Retz.) Alston and mineral fertilizer effect on maize grain (Zea mays L.) and Stover yields on ferralitic soils in southern Benin	Actes du 3eme Colloque des Sciences, Cultures et Technologies de l'Université d'Abomey Calavi, 6-10 juin 2011, Volume 3, Sciences naturelles et Agronomie, Section Elevage, Pêche et Pisciculture: 259-266. ISSN : 1840-5851, Edition Décembre 2012.
Crop and Pasture sciences	21	Adjolohoun S., Kindomihou V., Adandedjan C., Houinato M., Soumanou T., Nonfon W.R., Sinsin B.	Effet comparé de la fumure minérale et du fumier bovin sur une culture fourragère de Brachiaria ruziziensis (Germain and Everard) en zone soudanienne du Bénin	Actes du 3eme Colloque des Sciences, Cultures et Technologies de l'Université d'Abomey Calavi, 6-10 juin 2011, Volume 3, Sciences naturelles et Agronomie, Section Elevage, Pêche et Pisciculture: 267-276. ISSN : 1840-5851, Edition Décembre 2012.
Organic agriculture	22	Houndantode J., Kindomihou V., Tonon F., Amadji S.G., Boko M., Sinsin B.A.	Use of the Sewage sludge as a Tool for Promoting Organic Agriculture in Western Africa: Effect on the Cultivated Soils and the Yields of Amaranthus cruentus Linn. in Southern Benin	Actes du 3eme Colloque des Sciences, Cultures et Technologies de l'Université d'Abomey Calavi, 6-10 juin 2011, Volume 3, Sciences naturelles et Agronomie, Section Agronomie et Pédologie: 333-356. ISSN : 1840-5851, Edition Décembre 2012.

Appendix 12: Technical Reports and books in 2012

Field of research	N°	Authors' Name	Title	References
Regional planning	1	Ousséni AROUNA	*Elaboration des Schémas Directeurs d'Aménagement des Communes (SDAC) et des Schémas Territoriaux d'Aménagement et de Développement (STAD)*	PAGEFCOM/DGFRN/MEHU, Cotonou, Bénin, 13 p.
Wildlife conservation/Ethnozoology and ethnobiology	2	Djagoun C.A.M.S., H.A. Akpona, G.A. Mensah, C. Nuttman, B. Sinsin	Wild mammals trade for zootherapeutic and mythic purposes in Benin (West Africa): capitalizing species involved, provision sources and implications for conservation	DJAGOUN C.A.M.S., H.A. AKPONA, G.A. MENSAH, C. NUTTMAN & B. SINSIN. (2012). Wild Mammals Trade for Zootherapeutic and Mythic Purposes in Benin (West Africa): Capitalizing Species Involved, Provision Sources, and Implications for Conservation. R. R. N. Alves and I. L. Rosa (eds.), Animals in Traditional Folk Medicine, DOI: 10.1007/978-3-642-29026-8_17, © Springer-Verlag Berlin Heidelberg. pp 367-381.
Species conservation	3	Philipp Henschel, Martial Kiki, Clement Sewade & Aristide Tehou	*Projet pour l'établissement d'un plan de sauvegarde pour les grands carnivores dans le Complexe W-Arly-Pendjari (WAP).*	Philipp Henschel, Martial Kiki, Clement Sewade & Aristide Tehou; 2012. Projet pour l'établissement d'un plan de sauvegarde pour les grands carnivores dans le Complexe W-Arly-Pendjari (WAP). Rapport préliminaire, octobre 2012

Appendix 13: Participation at workshops/conferences in 2012

N°	Title and period	Type of presentation (oral, poster, ..)	Name of the participants from LEA
1	First IUFRO-FORNESSA Regional Congress & ITTO/AFF Forest Policy Day, 25-30 June 2012 NAIROBI, KENYA.	Oral communication	Djagoun Chabi Adéyèmi Marc Sylvestre, Assogbadjo Achille, Gouwakinnou Gérard, Sinansson Gisèle, Fandohan Belarmain, Azihou Fortuné
2	Training course in Writing Convincing Research Proposal, 23-24 JUNE 2012, Kenya Forestry Research Institute (KFRI), Nairobi, Kenya.	Attendance only	Djagoun Chabi Adéyèmi Marc Sylvestre
3	Training course "Introduction to Stable Light Isotope Mass Spectrometry". 28 May to 1 June 2012. Department of Archeology, University of Cape Town, South Africa.	Attendance only	Djagoun Chabi Adéyèmi Marc Sylvestre
4	Lab work at the Stable Light Isotope Laboratory in the Department of Archaeology at the University of Cape Town, supported by UCT and the South African National Research Foundation. 2-15 June 2012. Cape Town, South Africa.	Internship	Djagoun Chabi Adéyèmi Marc Sylvestre
5	Pharmacopée et la Médecine Traditionnelles Africaines (PMTA) tenu à Ndjamena au Tchad du 10 au 13 décembre 2012	Oral communication	Djego Julien Gaudence
6	XVème édition des Journées Scientifiques Internationales de l'Université de Lomé (Togo) du 22 au 26 octobre 2012	Oral communication	Assongba Faustin
7	symposium à l'Hommage du Professeur Emérite Edouard ADJANOHOUN, Premier Recteur de l'Université d'Abomey-Calavi, tenu au Campus d'Abomey-Calavi (Rép. du Bénin) du 26 au 28 septembre 2012	Oral communication	Djego Julien Gaudence Assongba Faustin
8	17e Colloque international en évaluation environnementale pour une gestion durable des ressources minières, énergétiques et biologiques ; SIFEE, tenu à Montréal au Canada du 12 au 22 juin 2012	Oral communication	Djego Julien Gaudence
9	Colloque scientifique sur la médecine traditionnelle au Bénin, tenu à l'ISBA du 23 au 24 août	Oral communication	Djego Julien Gaudence
10	Using Native Plants to Green African Economies. Xiamen Forum on Ecosystem Management ad Green Economy. Xiamen, China, 06 September 2012	Orale communication	Fandohan B
11	Using bioclimatic niche modeling and population structure to plan conservation actions for Tamarindus indica (Fabaceae) in Benin, West Africa. IUFRO-FORNESSA regional congress. Nairobi, Kenya, 25-29 June 2012	Oral presentation	Fandohan B
12	Assessing local knowledge, use patterns, functional properties and contribution of Synsepalum dulcificum (Sapotaceae) to rural women's income in Benin, West Africa. TWAS/Biovision.Nxt conference, Alexandria Egypt, 23-25 April 2012	Oral communication	Fandohan B
13	Global Youth Biodiversity Network Kick-off Conference, 21-27 August, Berlin, Germany.	Attendance only	AZIHOU Akomian Fortuné
14	IUFRO-SPDC Pre-Congress Training Workshop on "Preparing and writing research proposals", 23 to 24 June 2012, Muguga, Kenya.	Attendance only	AZIHOU Akomian Fortuné
15	Training course on Remote Sensing in partnership with Undesert Project, University of Abomey-Calavi, Free University of Brussels and University of Frankfurt am Main. 20 – 24	-Attendance only	AZIHOU Akomian Fortuné

	February 2012, Cotonou, Benin.		
16	Training course on ArcGIS in partnership with Undesert Project, University of Abomey-Calavi and University of Frankfurt am Main. 15 – 18 February 2012, Cotonou, Benin.	Attendance only	AZIHOU Akomian Fortuné
17	World Economic Forum, China, September, 2012	Oral communication	Romain Glele Kakaï.
18	Symposium à l'Hommage du Professeur Emérite Edouard ADJANOHOUN, du 26 au 28 Septembre 2012	Oral communication	Gerard N. Gouwakinnou
19	XVème édition des journées scientifiques internationales de Lomé tenue du 22 au 26 octobre 2012 au campus universitaire de Lomé	Oral communication	Lesse paolo, Koura Yvan, Ahoudji Myrèse /Houinato marcel
20	XIXème congrès de l'Association Béninoise de Pastoralisme tenue au champ de foire le 17 Noveembre 2012	Oral communication	Lesse paolo, Gbeffe Alain, Koura Yvan, Ahoudji Myrèse, Houndanon Roel/Houinato marcel
21	International Workshop on « Curriculum Development for Postgraduate Studies in Organic Agriculture in West Africa », organized by the WANOART (West African Network on Organic Agriculture Research and Training), Abeokuta (Nigeria), 6-13 March, 2012.	Oral communication	Emile N. Houngbo Valentin M. Kindomihou
22	International Training of Trainers Workshop on « Organic Agriculture: Ensuring Food Safety And Sustainable Agriculture for the Future », organized by the WANOART, Kumasi-KNUST (Ghana), 5-15 August, 2012.	Oral communication	Emile N. Houngbo Valentin M. Kindomihou Julien Avakoudjo Tatiana Koura
23	International Workshop on « Organic Certification Development », organized by the WANOART, Abomey-Calavi (Benin), 25 November – 1 December, 2012.	Oral communication	Emile N. Houngbo Valentin M. Kindomihou Julien Avakoudjo Tatiana Koura
24	Biennial Event of 'Terra Madre' for Biodiversity and Sustainable Agriculture Development in the World, Slow Food Foundation for Biodiversity, Turin (Italy), 24-30 October, 2012	Poster presentation	Emile N. Houngbo
25	Biodiversity informatics training courses; University of Colorado, Boulder Denver; USA ; July 2012	Participant	Martial Kiki
26	Effects of bowalisation process on biodiversity and adaptation strategies of plants in Sudano-Guinean transition Zone (Benin): Symposium en Hommage au Professeur Emerite Edouard Adjanohoun (26-28. 09. 2012), UAC. Benin	Oral communication	Padonou EA
27	Padonou EA, (2012) Farmers' perspectives on causes, consequences and coping strategies on bowalization: a case study from West Africa (Benin Symposium en Hommage au Professeur Emerite Edouard Adjanohoun (26-28. 09. 2012), UAC. Benin	Oral communication	Padonou EA
28	International workshop on organic certification held on 25 November to 1st december, 2012 at University of Abomey-Calavi & Centre Anouarite, of Abomey Calavi, benin republic.	Oral communication	Houehanou Thierry
29	XV ème Journées Scientifiques Internationales de Lomé, Campus Universitaire de Lomé du 22 au 26 Octobre 2012	Oral communication	Houehanou Thierry
30	Tropentag 2012 (Septembre 2012)	Poster	Koura Bossima Ivan
31	Journées Scientifiques Internationales de Lomé JSIL (22 AU 26 OCTOBRE 2012)	Oral	Koura Bossima Ivan
32	XIXème Congrès de l'Association Béninoise de Pastoralisme ABePa (Novembre 2012)	Oral	Koura Bossima Ivan

33	Participation in the Organic Certification Workshop, Faculty of Agronomic Sciences, University of Abomey Calavi, Benin. Ste Anouarite Center, A. Calavi. 25 Nov.-1st Dec. 2012	Workshop Coordination, Organizer	Kindomihou Valentin Houngbo Emile Avakoudjo Julien Koura Tatiana Houehanou Thierry Gouwakinnou Gerard Sinsin Brice
34	Participation in the Journées Scientifiques Internationales de Lome, XVeme Edition, JISL, University of Lome, Togo. Conference speaker on "Socioéconomie du déclin de la production cotonnière au Bénin : Cas du village Kodji (Centre Bénin)". 22-26 October 2012	Oral presentation	Kindomihou Valentin Avakoudjo Julien Houehanou Thierry
35	Participation in the Training of Trainers in Organic Agriculture, WANOART-EU-Edulink, KNUST, Kumasi, Ghana. 5-18 August 2012.	Training of trainers (oral communication and field works)	Kindomihou Valentin Houngbo Emile Avakoudjo Julien Koura Tatiana
36	Participation in 47TH Annual Congress, GRASSLAND SOCIETY OF SOUTHERN AFRICA, Club Mykonos, Langebaan, Western Cape, South Africa. Poster Presentation on: "How Chromolaena odorata affects phytodiversity, productivity and pastoral value of Guinean pastures in Benin (Western Africa)". 16-20 July 2012.	Oral presentation	Kindomihou Valentin
37	Participation in the organic Curriculum workshop Development, Federal University of Abeokuta, FUNAAB, Ogun State, Nigeria. 6-13 March 2012	Oral communication	Kindomihou Valentin Houngbo Emile
38	Scientific visiting in Federal University of Abeokuta, Nigeria in the frame of WANOART 2012 Mobility Programme, funded by EU-Edulink. Research Programme in organic vegetables Production. 1 – 22 February 2012. - Supervision of a research study on Growth and Yield of three indigenous vegetables (Amaranthus caudatus, Celosia argentea L., Corchorus olitorius L.) in response to poultry manure. - Invited Speaker in two conferences on: (1) Organic Agriculture and food security in Benin Republic (West Africa); (2) Tropical grass silicification: Assets and perspectives.	Oral communication Poster communication Field trips	Kindomihou Valentin Tatiana Koura
39	International workshop of CoS-SIS Programme, Elmina, Ghana, 22-26 October 2012	Oral presentation	Kpera Gnanki Nathalie
40	FAO technical workshop "Towards the establishment of a Global Network for in situ conservation and on-farm management of Plant Genetic Resources for Food and Agriculture ". FAO headquarters, Rome (Italia), 13 November 2012.	Group discussion	Assogbadjo Achille
41	Intra-ACP Coordinators' meeting 2012, Stellenbosch (South Africa), 17-19, October 2012	Group discussion	Assogbadjo Achille
42	3rd RUFORUM Biennial Conference, Entebbe (Uganda), 24th – 28th September 2012.	Participant	Assogbadjo Achille
43	PAEPARD EDULINK write-shop organised by RUFORUM, Entebbe (Uganda), 14th - 19th May 2012.	Write-shop	Assogbadjo Achille

Appendix 14: Research projects of LEA in which you have been involved in 2012

N°	Title of the project	Sources of Funding	Objectives of the project	Status (ongoing or ended)
1	Hessian State Initiative for the Development of Scientific and Economic Excellence LOEWE	Senckenbergische Naturforschende Geselischaft Goethe Universitat Frankfurt am Main	•Carrying out internationally outstanding research on the interactions of biodiversity and climate change at the organism level •Studying of dynamics of savannas and their ecosystem services •Investigating the dynamics of west African savannas under different climate and land use scenarios •Modelling and mapping distribution changes under different services •Combining change scenarios with different parameters of ecosystem services to evaluate the possible consequences of these changes for rural communities •Performing compiling of available data and ecological niche modeling approaches	Ongoing
2	UNDESERT	European Uninon	UNDESERT aims at providing an improved understanding of the effects of desertification and degradation processes by integrating remote sensing information with sound field data on biodiversity and soil as well as socioeconomic and climate data.	Ongoing
3	Fertilization effect on the productivity and resistance to blast disease of five rice varieties in Benin	Project of Agricultural Productivity in West Africa (PPAAO/INRAB)	Increasing rice productivity through mineral fertilization and pest control.	Ongoing
4	The wild palms of Benin: uses, biodiversity, ecology, economic importance and conservation	University of Abomey-Calavi	Enhancing the level of conservation and sustainable management of wild palms of Benin for food and economic security of the rural communities in the current context of genetic resource degradation and climate change	Ongoing
5	Analysis of morphological variability and ecological adaptation of Jatropha curcas in Benin.	Project of Africa Union	Contribute to the domestication of Jatropha curcas for the valorization of its commercial potential in Benin.	Ongoing
6	West African Network for Organic Agriculture Research and Training WANOART/ROARFAB	Edulink-European Union	• building a network for higher education institutes in West Africa for building capacities in organic agriculture, allowing West Africa to well profit it own potential in this field of activity. • increasing the expertise level in every aspect of organic agriculture in West Africa. • building a curriculum for organic agriculture in higher education institutes in West Africa; • attending a high habilitation with international markets and standards for certification; • enhancing a qualified environment, food security for farmers and the whole human society	Ongoing

N°	Title of the project	Sources of Funding	Objectives of the project	Status (ongoing or ended)
			• enhancing equipments acquisition for training in organic agriculture in west Africa • finding guidelines for standards for organic production for West Africa ; • developing staff and students exchanges among partners; • enhancing a sustainable network for promoting research in organic agriculture in West Africa	
7	Ecology and distribution of Irvingia species West Africa	NUFFIC/Netherlands	Overall objective = Improve our knowledge on ABMTs, focusing on the possible differences between the sweet and bitter types, thus supporting the development of suitable strategies for their domestication, conservation and use within the Dahomey Gap (West Africa) and possibly beyond that region. Specific objectives - Assess the ecological difference between sweet and bitter ABMTs in tropical Africa and discuss its taxonomic implication as well as the origin of the Dahomey Gap material. - Quantify the phenological characteristics of both types of ABMTs and infer the potential drivers of this variation as well as its taxonomic implication. - Investigate the distinction of sweet and bitter ABMTs in the field based on quantitative morphological data of leaves, bark and fruits. - Revisit the pattern of genetic diversity and the phylogenetic relationships between and within sweet and bitter ABMT populations throughout tropical Africa.	ended

Appendix 15: Research Grants in 2012

N°	Title of Grant	Beneficiaries	Status (ongoing or ended)
1	National Natural Science Foundation of China (NSFC) – Research Fellowship for International Young Scientists	Fandohan B	Ongoing
2	Postdoctoral Fellowship of the Chinese Academy of Sciences - Fellowship for International Young Scientists	Fandohan B	Ongoing
3	Grants from "Explorers club Grant Funding" for one year field study on the inventory and prioritization of crop wild relatives species, The Explorers Club, 46 East 70th Street, New York, NY 10021, US	Rodrigue IDOHOU	ended
4	CODESRIA-Nation Working Project Grant	Fandohan B, Chadare F, Gouakinnou G, Bonou A, Sinsin C, Assogbadjo A.E.	Ongoing
5	UNESCO MAB Young Scientists grants	Martial Kiki	Ongoing
6	Financial support of CERAAS (Regional Study Center for the Improvement of Adaptation to Drought)	Ata Toumnou Lucie (PhD student) and Research team: – Regional Centre for Studies on the Improvement of Plant Adaptation to Drought Thies, Senegal, – Regional Centre for Ecotoxicology Studies and Environment Security (CERES-Locustox), Dakar, Senegal, – Laboratory of Applied Ecology, Faculty of Agronomic Sciences, University of Abomey-Calavi, Benin – Department of Plant Biology,University Cheikh Anta Diop, Faculty of Sciences and Technology,Laboratory of Ecology and Ecohydrology, Dakar, Senegal, – Department of Animal Biology,University Cheikh Anta Diop, Faculty of Sciences and Technology, Senegal	Ongoing
7	DAAD (Deutscher Akademischer Austausch Dienst) scholarship for PhD studies and co-supervision in Senegal	Ata Toumnou Lucie (PhD student) and Research team: – Regional Centre for Studies on the Improvement of Plant Adaptation to Drought Thies, Senegal, – Regional Centre for Ecotoxicology Studies and Environment Security (CERES-Locustox), Dakar, Senegal, – Laboratory of Applied Ecology, Faculty of Agronomic Sciences, University of Abomey-Calavi, Benin – Department of Plant Biology, University Cheikh Anta Diop, Faculty of Sciences and Technology,Laboratory of Ecology and	Ongoing

N°	Title of Grant	Beneficiaries	Status (ongoing or ended)
		Ecohydrology, Dakar, Senegal, – Department of Animal Biology, University Cheikh Anta Diop, Faculty of Sciences and Technology, Senegal	
8	Senegal Government	Ngom D. and research Team: – Department of Agroforestry, University of Ziguinchor, Po. Box: 523 Ziguinchor, Senegal, – Laboratoire d'Ecologie et Hydro-écologie, Faculté des Sciences et Techniques, Université Cheikh Anta DIOP, – Sénégal, B.P. 5005 Dakar (Sénégal) – Laboratory of Applied Ecology, Faculty of Agronomic Sciences, University of Abomey-Calavi, 03 BP1974 Cotonou, Benin	Ended
9	IUCN-SSC Crocodile Specialist Group Student Research Assistance Scheme (UK) – Research grant	– KPERA Gnanki Nathalie	Ongoing
10	International Tropical Timber Organisation (ITTO) fellowship (Japan)	- Assogbadjo Achille	Ongoing
11	International Foundation for Sciences (IFS) Third Grants (Sweden)	- Assogbadjo Achille	Ongoing

Appendix 16: Prizes and nomination in 2012

N°	Title of prize / nomination	Nominee
1	African-German Network of Excellence in Science - Grant for Junior Researchers 2012	Belar main Fandohan
2	Elected Member of the Global Young Academy of Sciences, December, 2012	Romain Glele Kakaï

Appendix 17: Visitors received in 2012

N°	Full names of visitors	Provenance	Responsibles in LEA	Topics
1	Jorgen Axelsen	Denmark	Oscar tèka, Achille assogbadjo, Brice Sinsin	UNDESERT Project
2	Anne Mette	Denmark	Oscar tèka, Achille assogbadjo, Brice Sinsin	UNDESERT Project
3	Yvonne Bachmann	Frankfurt	Oscar tèka, Achille assogbadjo, Brice Sinsin	ArcGIS training
4	BSc Vonu Osman Sidie	Njala University, Sierra Leone. December 2011-January 2012	Kindomihou Valentin	Pedology and sustainable use of soil in organic agriculture
5	Prof Sawyerr Patrick	Njala University, Sierra Leone. December 2011-January 2012	Kindomihou Valentin	Pedology and sustainable use of soil in organic agriculture
6	Dr Eniola Fabusoro	Federal University of Agriculture of Abeokuta, Nigeria 27-29 September 2012	Kindomihou Valentin Houngbo Emile	Ecological Economics: "Environmental Management and Human Security/ Environment Friendly Farming: comparative case of Nigeria and Benin"
7	Prof. Maruyama Makoto	University of Tokyo, 27 to 29 September 2012	Kindomihou Valentin Houngbo Emile	Ecological Economics: "Environmental Management and Human Security/ Environment Friendly Farming: comparative case of Japan and Benin"
8	Dr Samuel MARTIN (Chair of IUCN-SSC Crocodile Specialist Group for West and Central Africa and Director of La ferme aux crocodiles de Pierrelatte" - France)	France	- Prof B. Sinsin - KPERA Gnanki Nathalie - Dr Kassa Barthelemy	- Preparation of the 3rd workshop of Crocodile Specialist Group for West and Central that will be held in Benin in December 2013 - Encouring studies on crocodile biology and conservation in Benin

Abstracts of articles in peer reviewed journals (published, in press & under review) in 2012

1. Magnoliophyta, Biosphere Reserve of Pendjari, Atacora Province, Benin

Emeline P. S. Assédé, Aristide C. Adomou and Brice Sinsin

Check List 8(4): 642–661, (2012).

Abstract

The Biosphere Reserve of Pendjari is an example of best management practice of protected areas in West Africa with typical Sudanian savanna vegetation. It is part of the vast and transboundary protected areas of W, Pendjari and Arly National Parks of Benin, Burkina Faso and Niger. This work provides an overview of the flora of the reserve by means of a thorough botanical inventory. The plant species composition is typical of Sudanian savanna. We recorded 684 plant species, which were distributed among 366 genera and 89 families. The two most species-rich families were Fabaceae (115) and Poaceae (112). The most important life forms were phanerophytes and therophytes. The chorological spectrum was dominated by Sudanian species. With Ipomoea beninensis Akoègninou, Lisowski and Sinsin, Thunbergia atacorensis Akoègninou and Lisowski and Cissus kouandeensis A.Chev., three endemic species of Benin were recorded, demonstrating the importance of the reserve for plant conservation.

Key words: Floristic richness, Pendjari, Benin.

2. Relationship between stand regime and population structure of Pseudocedrela kotschyi (Meliaceae) and Terminalia macroptera (Combretaceae) in the Biosphere Reserve of Pendjari (Benin, West Africa)

Emeline P. S. Assédé, Aristide C. Adomou and Brice Sinsin

International Journal of Biodiversity and Conservation Vol. 4(12), pp. 427-438.

Abstract

One of the major reasons for reforestation failure using tropical species is misunderstanding of the neighbourhood relationship within tree populations. This study used the natural stand structures of Terminalia macroptera and Pseudocedrela kotschyi, two socio-economically important species, to design enrichment planting. A comparative analysis of the population structure of P. kotschyi and T. macroptera in two regimes (pure and mixed) was performed. However, results indicated that young T. macroptera individuals were predominant in both stand regimes. In the same way, no significant difference was found between diameter size classes with respect to stand regime. Trees showed weak density and a random pattern with the nearest neighbour distances varying between 5.67 (pure) and 7.01 m (mixed). P. kotschyi young individuals were also found to be predominant irrespective of stand regime; yet, the diameter size class distributions revealed significant variations with respect to stand regime. Trees had a higher density and stronger clumped pattern in pure stand as compared to mixed stand. The nearest neighbour distances ranged from 2.97 (pure) to 4.87 m (mixed). Our findings highlighted the relevance of taking into account relationships between stand regime and tree population structure while designing artificial plantings.

Key words: Savanna woodland, density, spatial distribution, diameter class structure.

3. Secondary succession and factors determining change in soil condition from fallow to savannah in the Sudanian Zone of Benin

Emeline P. S. Assédé, Aristide C. Adomou and Brice Sinsin

Phytocoenologia, 42 (3 – 4), 181 – 189.

Abstract

Demand for land for agriculture remains one of the greatest threats to the natural vegetation in the Sudanian Zone in Africa. This work aimed to assess the patterns of the secondary succession around the Biosphere Reserve of Pendjari in northern Benin and to establish its relationships with soil properties. Fallow vegetation was stratified by age and four succession states were recognized. Phyto-ecological inventories were carried out within plots of 30 m × 30 m. Soil physico-chemical properties were determined in fallows that best represent the succession states. Numerical analyses of vegetation data resulted in four fallow types, which corresponded to the four vegetation succession states empirically recognized earlier. The first state was characterised by the proliferation of widespread species that disappeared by the third state. The therophytes and chamaephytes, abundant during the first state, were replaced by hemicryptophytes and phanerophytes in the last state. About 22 % of the 233 species recorded were recorded throughout fallow cycle. The first succession state exhibited the highest species richness with 18.6 % of all species exclusive to this state. The transition from the fi rst to the second state was characterised by the disappearance of 77 % of the total species richness. Organic Matter and the Species Richness were the best discriminating variables of the succession states. Soil exchangeable cations (K+, Mg2+ and Ca2+) did not show significant differences between the first and second succession states, but OM and P increased significantly along the succession gradient. The secondary succession exhibited a clear floristic pattern with a progressive establishment of the woody vegetation. This was followed by a gradual recovery of soil fertility through the process of organic matter cycling.

The colonization of herb layer by Andropogon gayanus var. bisquamulatus (typical Sudanian species) during the third state can be seen as an indication of a substantial return to soil fertility.
Keywords: vegetation recovery, organic matter, Biosphere Reserve, Pendjari, Benin.

4. Plant life forms and chorological types as good indicators of land use impact on vegetation patterns in Benin

Emeline P. S. Assédé, Aristide C. Adomou and Brice Sinsin

Flora Sudano-Sambesica **(Under review)**

Abstract

Human populations around protected areas have significant, negative impacts on biodiversity. This study aimed to examine land use impacts within the Biosphere Reserve of Pendjari (BRP) on savanna vegetation using life forms and chorological types as indicators of disturbance. The relevés consisted of plots sized 30 m x 30 m established 1 km apart along 4 transects. Phytosociological data according to the Braun-Blanquet method were used. A total of 375 plants species were recorded. Four vegetation types were identified along an anthropogenic gradient. Floristic composition changed from fields to savanna woodlands. Contrary to phanerophytes and hemicryptophytes, the cover of therophytes and chamephytes increased with the disturbance level of vegetation. Paleotropical and pantropical species were positively correlated with the intensity of vegetation degradation. Land use effect was most expressed by chorological groups. Additional studies are needed to highlight all of the indicators of perturbationsfor developing possible sustainable management systems of the natural resources. The way ecosystem changes with farming in the BRP must be measured as a function of changing agricultural practices.
Key words: vegetation gradient, anthropogenic disturbance, savanna, reserve.

5. Vigilance efficiency and behaviour of Bohor reedbuck Redunca redunca (Pallas 1767) in a savanna environment of Pendjari Biosphere Reserve (Northern Benin)

Chabi A. M. S. DJAGOUN, Bruno A. DJOSSA, Guy. A. MENSAH, Brice A. SINSIN

Mammal Study **(in press)**

Abstract

This study was performed to gain more knowledge about the Bohor reedbuck time budget and vigilance in a savanna habitat. Detailed data on the time-budget were collected through focal animal observation technique to determine whether the time budget activities of Bohor reedbuck was affected by vegetation cover and to test if herd size, position in herd, the age and sex affect vigilance efficiency. We fit generalized linear mixed-effect models to assess how herd size, sex, animal position in the herd and age affected individual time allocation to vigilance behaviour. The most parsimonious model, averaging clearly showed how vigilance behaviour among Bohor reedbuck was strongly affected by age, sex, the total herd size and animal position in the herd accounting for the lowest Δ value of Akaike Information Criterion (AIC). Vigilance and feeding behaviour occupied the largest percent of Bohor reedbuck daylight time budget. Herd size effects were significant on different behaviour categories only when the Bohor reedbuck was observed in sympatric association. Our findings support the herd size effect hypothesis only in sympatric grouping system. However, further study is needed to investigate the possible sex-specific functions and targets of vigilance behaviour with respect to the herd direction in the field.
Key words: Vigilance, herd effect, time budget, behaviour, sympatric ungulate

6. Analyses écologique et structurale de la forêt communautaire de Kaodji au Bénin

Julien DJEGO, Moussa GIBIGAYE, Brice TENTE et Brice SINSIN

Int. J. Biol. Chem. Sci. **6(2): 705-713, April 2012**

Résume

La forêt communautaire de Kaodji au Bénin regorge d'importantes ressources biologiques, qui ne sont pas encore toutes bien connues. Cette étude examine les caractéristiques écologique et structurale de cette forêt. A cet effet, la diversité floristique a été estimée au moyen de 48 relevés floristiques effectués selon la méthode sigmatiste de Braun-Blanquet (1932) dans différentes strates forestières et d'indices de diversité. Des mesures dendrométriques, de distances et de pentes ont été effectuées en vue de déterminer le profil structural lié à chaque type de phytocénoses et celui topographique de la forêt de Kaodji. Cette forêt se remarque notamment par deux strates nettement indépendantes (indice de Jaccard < 0,45). Il s'agit de : (i) la savane arbustive ayant pour espèces dominantes, Combretum collinum et Daniella oliveri ; (ii) et la forêt claire marquée

par Isoberlinia doka et Combretum collinum. Leurs richesses floristiques moyennes sont respectivement de 36 et de 49. Les indices de Shannon et l'équitabilité de Piélou montrent des valeurs relativement faibles (2,33 bits et 0,45 en savane et 2,69 bits et 0,48 en forêt claire). La répartition par classe de diamètre des arbres dans ces deux milieux présente l'allure d'un « J » renversé et s'ajuste au mieux à une fonction logarithmique. Sur le plan topographique, cette forêt présente un relief vallonné d'allure pittoresque pouvant constituer un site touristique en cas de conservation et d'aménagement.
Mots clés : Forêt communautaire, topographie, phytodiversité, Kaodji, Bénin.

7. Effectiveness of the medicinal plant R019 in the treatment of HIV infection: an observational study

Aurel Constant Allabi, Richi Dossa, Julien Gaudence Djeigo, Jean-Cyr Yombi, Kouma Diombo, André Bigot and Priuli Giambattista

***Journal of Applied Pharmaceutical Science* 02 (02); 2012: 59-65**

Abstract

This study aims to evaluate the in vivo antiviral, immunologic, clinical effects and safety of a supposedly anti-HIV phytotherapy, code-named R019 used for the treatment of HIV/AIDS. This is an open observational study, which involved 32 HIV-1 infected patients, who were followed over a 3-month period. The efficacy evaluation was based on CD4 count, determination of viral load and clinical status. The safety evaluation was based on renal and liver function tests, fasting lipid and glycaemia levels as well as the frequency of other adverse events. The CD4 values increased significantly (mean±SD, 99.03±22.87 cells/µL; P<0.001), as well as Weight and Karnofsky score (2.94±0.67 kg, p<0.001; 4.9, p=0.005 respectively). The viral load decreased significantly (0.91±0.12 log viral load, P<0.0001). R019 did not impair renal or liver functions. Improvement of creatinine clearance was observed (p=0.02). Hemoglobin levels increased (0.38±0.16 gr/dL) whereas cholesterol and glucose levels decreased under R019 treatment (p=0.031, p=0.018 respectively). Main adverse effects were recorded: polyuria (40.5%), drowsiness (21.4%), orexis (19.1%). Immunological, anti-viral and clinical status improved under R019 treatment and a good safety profile was observed for this compound. Further studies would be required to optimize its efficacy and to define its appropriateness for the treatment of HIV disease.
Keywords: R019, HIV infection, Efficacy, Safety

8. Diversity of Medicinal Plants and Preliminary Parameterization of their Uses in Benin (Western Africa)

Padonou Elie Antoine Kindomihou Missiakô Valentin Djègo Julien Gaudence Sinsin Brice Augustin

***Journal of Asian Scientific Research* Vol.2, No.4, pp.212-220.**

Abstract

An investigation was conducted in Benin botanical gardens, endogenous therapeutic gardens and forests in order to assess diversity of medicinal plants and their endogenous, alimentary and medicinal importance. A preliminary parameterization to assess the importance range of these medicinal plants was performed. To that end, three indices were built such as National Identity Coefficient (NIC), National Utility Coefficient (NUC), and Alimentary Utility Index (AUI) per family. Relation between these indices and botanical families was assessed using factorial correspondence analysis. Ailments treated per family and percentage of organ solicited per family, were also assessed. As results, the medicinal plants observed globally belong to 15 botanical families. The NIC ranges from 0.31 to 1, and shows eight families that are mostly identified at national scale. The NUC ranges from 0.26 to 1, and indicates seven mostly useful families, i.e. Apocynaceae, Capparidaceae, Euphorbiaceae, Annonaceae, Meliaceae, Rutaceae and Sterculiaceae; but these are not belonged to the most identified families at the national scale. The AUI ranging from 6 to 50, pointed out eight families i.e. Capparidaceae, Annonaceae, Sterculiaceae, Mimosaceae, Bignoniaceae, Combretaceae, Ceasalpiniaceae and Bombacaceae; these are mostly used as food, with 50% highly solicited in treating more ailments. Polygaceae and Flacourtiaceae are the mostly threatened as 70% of their species roots are solicited for various uses. Further studied are needed to standardize these indices. Key words: Medicinal Plants, Family, Parameterization

9. Croyances Traditionnelles et Conservation du Colobe de Geoffroy, Colobus vellerosus (Geoffroy, 1834), dans la Forêt Sacrée de Kikélé, Bénin (Afrique de l'Ouest)

S. Djego-Djossou1, M.C. Huynen2, J. Djègo1 & B. Sinsin1

***African Primates* 7 (2): 193-202 (2012)**

Abstract

In Africa, traditional beliefs play a vital role in biodiversity conservation. We studied the attitudes and perceptions of Kikele villagers towards the Geoffroy's pied colobus in the sacred forest of Kikele, Republic of Benin, using an ethnographic approach based on personal interviews. Our results suggest that the population of colobus has been protected by the Kikele population's traditional beliefs for several decades. This ethnozoological consideration could contribute to the conservation of Geoffroy's pied colobus, Colobus vellerosus, especially at this present moment where the status of the species is degraded throughout its area of distribution.

Key words: *Colobus vellerosus*, conservation, traditional beliefs, ethnographic approach, Benin

10. IMPACT ET BENEFICE DE L'INTEGRATION DES PLANTATIONS DANS LE PLAN DE ZONAGE D'UNE AIRE PROTEGEE

J. DJEGO, L. DJODJOUWIN, & B. SINSIN

***Annales des Sciences Agronomiques* 16 (2) : 161-179, 2012 ISSN 1659-5009**

RESUME

Different categories of Protected Area (PA) such as the IUCN/WCPA category V and VI or the UNESCO Biosphere Reserve allow at certain extent some utilisation of land or natural resource inside PA zones. Based on that some degree of disturbance is allowed and in that way some management activities could be noticed as settlement like hotels inside PA, hunting camp or other controlled settlements. Tree plantation is another utilisation of some part of a PA zone experienced in Benin. Teak tree (Tectona grandis) plantation among others tree species (Acacia auriculiformis, Eucalyptus camaldulensis, Casuarina equisetifolia, Khaya senegalensis, etc.) showed interesting income generation for local population participation to PA co-management system. Exploitation of teak plantation in such a way gave means to PA managers to cover their administrative and operational costs to better protect biodiversity without lying on a non sustainable project-based financing system. So far some impacts were also noticed on flora diversity as tree plantation was seen as constraint for plant and other animal species richness. Teak plantation didn't contribute to increase plant species diversity inside the whole Protected Area. Evaluation of this type of ''Silvoforestry'' system showed that the benefit is more at social and economical level than biodiversity improvement per se. The need for a plan of considered adjustment and management reconciling socio-economic advantages and safeguarding of the natural resources is highly indicated.

Keywords: impact, protected area, tree plantation, co-management

11. Which one comes first, the tamarind or the Macrotermes termitarium?

Belarmain Fandohan, Achille E. Assogbadjo[1], Valere K. Salako, Patrick van Damme, Brice Sinsin

Acta Botanica Gallica 159:3 (2012): 345-355

Abstract

The relationship between termitaria and their vegetation is being increasingly studied. Nonetheless, our understanding of the order of establishment of termitaria and their associated vegetations which may be relevant for developing conservation plans is limited. This study focuses on order of establishment of Macrotermes termitaria and associated plant species with a special focus on Tamarindus indica and was to answer whether tamarind trees establish before termitaria or reversely? A comparative analysis of T. indica-dominated vegetations on termitaria and adjacent vegetations was undertaken using a matrix involving 80 relevés across four phytogeographical districts (phytodistricts), and an Indicator Species Analysis. We discussed how informative vegetation data could be on termitaria and tamarind trees establishment order. Whatever the phytodistrict, vegetations associated with termitaria were found to be much similar to those of their adjacent areas. Overall, only seven species (not including T. indica) out of a total of 63 recorded were found to be confined to termitaria. These results would suggest termitaria to not be a factor controlling establishment of T. indica and most of the species their host. Comparative vegetation analysis was thus found not to be enough to stand on termitaria and T. indica establishment order. However, termitaria-tamarind associations may be profitable to both tamarind trees and termites: termitaria may help mitigate drought on tamarind trees under increasing drought conditions while tamarind trees may offer food to termites. Integration of information on termite species' feeding preferences and ecology was proposed in order to improve current state of knowledge on tamarind-termite relationship.

12. A countrywide multi-ethnic assessment of local communities' perception of climate change in Benin (West Africa)

Aida Cuni Sanchez, Belarmain Fandohan, Achille Ephrem Assogbadjo, Brice Sinsin

***Climate and Development* 4 (2) (2012): 114–128**

Abstract

Climate change poses significant challenges to biodiversity, food security, water availability and health, especially in Africa. Research within local communities can lead to a better understanding of the observed changes in climate, and help to find more appropriate strategies for dealing with them. A number of studies have been carried out in West Africa, but most focus on Sahelian countries and all focus on a single area with one or two ethnic groups. Therefore, to determine whether a countrywide multi-ethnic assessment could provide more accurate information, we studied perceptions of climate change in local communities in Benin. Two focus groups (men and women) were carried out in nine villages. Local farmers and herders were asked about the changes in climate they have observed, the effects of these changes, and how they have adapted to them. Observed changes in climate followed a latitudinal trend, and were in agreement with available climatic studies. Some of the observed changes in climate had not been reported before for this latitude in West Africa. The effects of these climatic changes and the adaptive strategies used differed between areas and ethnic groups. Some adaptive strategies were only used by some ethnic groups. We found that the main obstacles preventing communities from adopting new strategies were unavailability of credit, lack of improved seeds and insufficient information. The findings support the conclusion that country-level multi-ethnic assessments provide key information for both climate change research and policy development.

13. Variation in biochemical composition of baobab (Adansonia digitata) pulp, leaves and seeds in relation to soil types and tree provenances

Achille Ephrem Assogbadjo, Flora Josiane Chadare, Romain Glele Kakaï, Belarmain Fandohan, Joseph Jojo Baidu-Forson

***Agriculture, Ecosystems and Environment* 157 (2012) 94–99**

Abstract

The present study was conducted in Benin to understand the effects of provenance, genetic variation and the effects of soil physicochemical characteristics on nutrient concentration of baobab pulp, leaves and seeds. Baobab parts were sampled from genetically different populations and soils in different climatic zones of Benin. Biochemical composition of baobab pulp, leaves and seeds was matched to different provenance and physicochemical characteristics of the soil. Results showed that the physicochemical characteristics of the soil seem to influence the nutritive value of baobab parts. Specifically, highly basic soils, rich in carbon, clay, fine silt and organic matter seem to positively relate with the concentration of iron, potassium, vitamin C, carbohydrates, zinc, proteins and lipids. However, for those same soils, the observed relationship between the soils and baobab parts concentration in magnesium, calcium, vitamin A and fibers was negative. Soils rich in gross silt and sand were found to have an opposite effect on these same parameters.

14. Genetic Evidence of the Contribution of Ethnic Migrations to the Propagation and Persistence of the Rare and Declining Scrambling Shrub Caesalpinia bonduc L

Achille E. Assogbadjo, Belarmain Fandohan, Romain Glèlè Kakaï,Tina Kyndt, Olivier J. Hardy, G. Gheysen, Brice Sinsin

***Human Ecology* (2012) 40:117–128**

Abstract

This paper examines the contribution of human migrations to the propagation and maintenance of Caesalpina bonduc by means of an analysis of its population genetics and distribution patterns. One hundred and forty seven sites were surveyed in the three climatic zones of Benin and all individuals of the species were recorded. A set of individuals was randomly selected and sampled from seven populations and morphological variation and genetic diversity were assessed. The study confirmed the presence of the species in all climatic zones but its abundance varied greatly. Morphological variability between populations and zones was low in comparison with the high amount of variation within populations. AFLP and cpDNA finger- printing revealed an extremely low genetic diversity within populations and a low genetic differentiation, suggesting parental links between populations. The results support the hypothesis of human involvement in Caesalpinia dispersal and persistence in Benin. However, the low genetic diversity may imply high risks for future extinction. We recommend that gene flow among the remaining populations be supported in order to conserve the species.

15. Uses and management of black plum (Vitex doniana Sweet) in Southern Benin

Colombe DADJO1, Achille Ephrem ASSOGBADJO, Belarmain FANDOHAN, Romain GLÈLÈ KAKAÏ, Sebastian CHAKEREDZA, Thierry Dèhouégnon HOUEHANOU, Patrick Van DAMME, Brice SINSIN

***Fruits* 67 (4) (2012) : 239–248**

Abstract

Black plum (Vitex doniana) is an indigenous fruit tree species important for the livelihoods of rural populations. Currently, there is renewed national and international interest in black plum, and it has emerged as a priority species for domestication in Africa. The present work addressed farmers' indigenous knowledge of the use and management of the species among different socio-cultural groups in Benin, taking into account gender differences. The specific objective of this work was to study the knowledge, uses, local gathering practices and management systems of V. doniana that are part of the traditions of the communities in Southern Benin. A total of 150 participants randomly selected from three socio-cultural groups provided survey responses. Information collected mainly referred to the motivation of respondents to conserve black plum trees on their land, the local uses and the management practices to improve the regeneration and production of the black plum. The study showed that knowledge of black plum is well distributed in the community. However, people have different interests in using black plum and there is variable knowledge of use and management practices. The food and medicinal categories were the most important uses. There were no significant differences in knowledge of the management and utility of black plum between men and women, or across socio-cultural groups. Given its value to the communities in southern Benin, black plum should be prioritized for domestication.

16. Structure spatial des arbres des savanes boisées et forêts claires soudaniennes : implication pour les enrichissements forestiers

Gilbert Atindogbe, Noël Houédougbé Fonton, Belarmain Fandohan, Philippe Lejeune, Ghautier Ligot

***Biotechnology Agronomy Society and Environment* 16(4) (2012):429-440**

Résumé

L'aménagement forestier des savanes boisées et forêts claires en zone soudanienne au Bénin a eu recours, ces dernières années, à l'enrichissement en essences locales de valeur. Cependant, aucune étude préalable n'a été menée pour déterminer l'environnement local de chaque arbre, l'habileté des arbres à croître ou encore leur probabilité de survie dans un complexe forestier. Cette étude a utilisé la fonction de second ordre K de Ripley pour analyser la répartition spatiale des arbres, des grosseurs d'arbres et des essences dominantes de valeur. Les données ont été collectées sur quatre sites de dimensions variables (150 x 100 m, 150 x 100 m, 100 x 50 m et 150 x 150 m). Il ressort de l'analyse des résultats que la plupart des essences étudiées présentent une répartition spatiale en de petits agrégats au sein desquels on observe des répulsions intraspécifiques de l'ordre de 3 m et des répulsions interspécifiques de l'ordre de 4,5 m. Par ailleurs, seule une faible répulsion est observée entre classes de grosseur et suggère que la proximité des pieds adultes n'affecte pas la survie des jeunes plants. Tenant compte des comportements de répulsion, on pourrait suggérer un écartement intraspécifique minimum de 3 m et un écartement interspécifique minimum de 4,5 m dans les processus d'enrichissement des savanes boisées et forêts claires en zone soudanienne. Toutefois, les espacements suggérés peuvent ne pas être optimaux du point de vue de la croissance des espèces. Des travaux supplémentaires permettraient d'éclaircir ce point.

17. Caractérisation des plantations privées de teck (Tectona grandis L.f.) du department de l'Atlantique au Sud-Bénin

Gilbert Atindogbe, Noël Houédougbé Fonton, Belarmain Fandohan, Philippe Lejeune

***Biotechnology Agronomy Society and Environment* 16(4) (2012):441-451**

Résumé

Les plantations de teck constituent, au Sud-Bénin, un atout socio-économique et environnemental indéniable. Des planteurs privés s'y intéressent pour répondre à leurs besoins financiers grâce à la production et à la vente de bois de service. Or, pour aménager durablement des ressources, une bonne connaissance de leurs propriétaires est indispensable. La méthode d'échantillonnage « boule de neige » a été utilisée pour identifier les propriétaires des plantations privées de teck. Cette méthode d'échantillonnage s'appuie sur les indications des premiers propriétaires rencontrés pour en contacter d'autres. Les données sur les profils socio-économiques des propriétaires ainsi que sur les caractéristiques dendrométriques de leurs plantations ont été collectées. Les mesures dendrométriques ont été effectuées par échantillonnage en bandes. L'analyse

factorielle suivie de la classification hiérarchique et de l'analyse discriminante pas à pas ont été réalisées pour définir le profil des propriétaires. Nous avons recensé 2 431 propriétaires et 2 624 plantations. Les jeunes plantations (5 ans au plus) représentent 16,4 % du total, les plantations éduquées en futaie 12,7 % et les taillis, 70,9 %. Les plantations sont en général de petite taille (0,44 ha en moyenne). Les densités de plantation élevées (en moyenne 3 371 tiges·ha-1 dans les jeunes plantations, 3 006 tiges·ha-1 en futaies et 6 305 tiges·ha-1 en taillis) témoignent d'un mode de sylviculture paysanne. La superficie plantée et la motivation sont les meilleurs discriminants entre groupes. Quatre groupes de propriétaires ont été identifiés : les petits planteurs paysans (groupe 1) dont la motivation principale est la vente de bois, les petits planteurs citadins et les personnes morales (groupe 2) qui souhaitent sécuriser la propriété de leurs parcelles, les propriétaires majoritairement citadins possédant une plantation de taille moyenne (groupe 3) et les gros planteurs investisseurs (groupe 4) motivés par la vente de bois ou la sécurisation du foncier. La gestion durable des teckeraies du Sud-Bénin devra prendre en compte les spécificités de chaque groupe, leurs atouts et contraintes.

18. Floristic and dendrometric analysis of woodlands in the Sudano-Guinean zone: a case study of Belléfoungou forest reserve in Benin

George Houéto, Belarmain Fandohan, Amadé Ouédraogo, Expédit E. Ago, Valère K. Salako, Achille E. Assogbadjo, Romain Glèlè Kakaï, Brice Sinsin

Acta Botanica Gallica **(in press)**

Abstract

A floristic and dendrometric analysis was carried out using fifteen square plots of 1 ha in the Belléfoungou forest reserve, located in the Sudano-Guinean zone of Benin. Species and diameter at breast height of trees were recorded. Multidimensional scaling and importance value index of species were used to identify vegetation types in the reserve: (1) Isoberlinia tomentosa dominated vegetation type, (2) Isoberlinia doka and Burkea africana dominated vegetation type and (3) Vitellaria paradoxa and Isoberlinia doka dominated vegetation type. Significant differences are noticed between the three vegetation types with respect to the basal area of trees. It varies from 8.55 m2/ha (vegetation type 3) to 13.36 m2/ha (vegetation type 2). The overall woody species richness is 57 species. The stem diameter structures of all three vegetation types show an inverse "J" shape, suggesting that the study reserve have stable natural vegetations with relatively more young stems than large stems. Setting and implementation of a sustainable management plan, and supervision reinforcement were suggested to enable conservation of the Belléfoungou forest reserve.

19. National Inventory and Prioritization of Crop Wild Relatives: case study for Benin

Rodrigue IDOHOU, Achille Ephrem ASSOGBADJO, Belarmain FANDOHAN, Gerard Nounagnon GOUWAKINNOU, Romain Lucas GLELE KAKAI, Brice SINSIN, Nigel MAXTED

Genetic Resources and Crop Evolution **(in press)**

Abstract

Species prioritization is a crucial step in any development of conservation strategy, especially for crop wild relatives (CWR), since financial resources are generally limited. This study aimed at: assessing the biodiversity of crop wild relatives in Benin and identifying priority species for active conservation. Data were collected through literature review to establish an exhaustive list of CWR in Benin. Eight prioritization criteria and different prioritization systems were used. The top 50 species obtained by each of these methods were identified and twenty final top CWR were shortlisted as those occurring as priority across methods. A total of 266 plant species belonging to 65 genera and 36 families were identified. The most represented are: Cyperaceae (12.50%), Leguminosae-Papilionoideae (11.87%), Convolvulaceae (11.25%), Poaceae (10.31%), Asteraceae (7.81%), Solanaceae (6.87%) and Dioscoreaceae (5.31%). Among the 20 species of highest priority for conservation, *Manihot glaziovii*Müll.Arg.and*Piper guineense* Schumach. et Thonn., appeared as the most represented species on top of the list.

20. Distribution of tree species along a gallery forest–savanna gradient: patterns, overlaps and ecological thresholds

Akomian Fortuné Azihou, Romain Glèlè Kakaï, Ronald Bellefontaine, Brice Sinsin

Journal of Tropical Ecology **(in press)**

Abstract

Savannas intermingled with gallery forests are dynamic habitats typical in Africa. This study aims to determine if differences in species traits lead to non-overlapping distribution of gallery-forest and savanna species and abrupt transition between gallery forest and savanna. Tree species densities were measured in 375 plots of 1500 m^2 covering a total sample area of

56.25 ha along forty 3-km transects located at right angles to a riverbed with gallery forest into surrounding savanna. Location, vegetation type, soil physical properties, erosion and fire occurrence were recorded as site factors. Data analysis included the quantification of co-occurrence patterns, threshold indicator taxa analysis and fuzzy set ordination. The gallery forest-savanna gradient predicted floristic composition of plots with a correlation of 0.595 but its accuracy was locally modified by the occurrence of fire and the physical properties of soil that covered more than 30% of the range of residuals. The distribution of gallery-forest and savanna tree species did not overlap. Along the gallery forest-savanna gradient, savanna species gradually increased in density while gallery-forest species showed a community threshold at 120 m from the river beyond the width of gallery forest. The forest species driving this trend should play an important role in the dynamics of gallery forest-savanna boundaries.

Key Words: Africa, Benin, community analysis, ecological thresholds, environmental synthesis, fuzzy set ordination, indicator species, species co-occurrence, vegetation dynamics, woody flora

21. On The Empirical Performance Of Non-Metric Multidimensional Scaling In Vegetation Studies

V. K. Salako, A. Adebanji and R. Glèlè Kakaï

***Mathematics Subject Classification*: 91C15, 68U20**

Abstract

Non-metric multidimensional scaling (NMDS) is widely used as a routine method for ordination in vegetation studies. Its use in statistical softwares often requires the choice of several options on which the accuracy of results will depend. This study focuses on the combined effect of sample size, similarity/dissimilarity indexes, data standardization and structure of data matrix (abundance and binary) on NMDS efficiency based on real data from the Lama Forest Reserve in Southern-Bénin. The Spearman's Rank Correlation coefficient and the s-stress were used as an assessment criterion. All the four factors were found to influence the efficiency of the NMDS and the samples (plots) standardization to equal totals gave the best results among standardization procedures considered. The Jaccard and Sorensen similarity/dissimilarity indexes performed equally whatever the nature of the matrix. However, with binary matrices, Sokal and Michener similarity index performed better. A quadratic relationship was noted between s-stress and sample size. A lower optimal sample size (75 plots) was observed for the binary matrices than for the abundance ones (90 plots).

Keywords: Non-metric multidimensional scaling, efficiency, vegetation studies.

22. Using niche models to inform conservation of an indigenous fruit tree species (Sclerocarya birrea) under changing climate in Benin (West Africa)

Gerard Nounagnon Gouwakinnou, Barthelemy Kassa, Valentin Kindomihou, Achille Ephrem Assogbadjo, Brice Sinsin

***African Journal of Ecology* (under review)**

Abstract

Aside from human-induced threats, climate change is the most persistent cause of threats that are affecting plant and animal populations. The risk and uncertainties associated with this threat call for the necessity to account for it in conservation planning. Habitat suitability modelling combined with GIS were used to model distribution (horizon 2050) of *Sclerocarya birrea*, a local fruit tree species native to semi-arid zones of Africa under present and three future climate models. The species presence records were obtained from fieldwork and herbarium records. Environmental variables were derived from monthly temperature and rainfall obtained from WorldClim database. Spatially correlated predictor variables were eliminated prior to modeling in Maxent. Results showed that the current suitable range of the species expands from the Sahelian to the Sudanian zones of West Africa. Under future climate, results predominantly varied with climate models with less likelihood of reduction in the suitable habitat of the species at regional level. The Gap analysis at Benin level suggests that the existing protected areas will still be effective in conserving the natural population of the species. However, in non-protected areas, conservation through use in agricultural systems should be considered for the sustainable use of the species.

Keywords: Climate change; protected area; gap analysis; MaxEnt; Tree genetic resources; Benin.

23. Ethno-botanical study of the African star apple (Chrysophyllum albidum G. Don) in the Southern Benin (West Africa)

Laurent G Houessou, Toussaint O Lougbegnon, François GH Gbesso, Lisette ES Anagonou and Brice Sinsin

***Journal of Ethnobiology and Ethnomedicine* 8:40**

Abstract

Background: In addition to plant species biology and ecology, understanding the folk knowledge systems related to the use of plant species and how this knowledge system influences the conservation of plant species is an important issue in the implementation of sustainable strategies of biodiversity conservation programs. This study aimed at providing information on the use and local knowledge variation on *Chrysophyllum albidum* G. Don a multipurpose tree species widely used in southern Benin.

Methods: Data was collected through 210 structured interviews. Informants were randomly selected from ten villages. The fidelity level and use value of different plant parts of *C. albidum* were estimated. The variation in ethnobotanical knowledge was assessed by comparing the use value between ethnic group, gender and age groups. In order to assess the use pattern of the different plant parts in folk medicine, a correspondence analysis was carried out on the frequency citation of plant parts.

Results: Four categories of use (food, medicine, firewood and timber) were recorded for *C. albidum*. With respect to the different plant parts, the fleshy pulp of the African star apple fruit showed high consensus degree as food among the informants. Fifteen diseases were reported to be treated by the different parts of *C. albidum* in the region. Correspondence analysis revealed the specificity of each part in disease treatment. There was no significant difference among ethnic groups regarding the ethno-botanical use value of *C. albidum*. However, significant difference existed between genders and among age groups regarding the knowledge of the medical properties of this species.

Conclusions: *C. albidum* is well integrated in the traditional agroforestry system of the southern Benin. Despite its multipurpose character, this species remains underutilized in the region. Considering the current threat of habitat degradation, action is needed in order to ensure the long term survival of the species and local communities' livelihoods.

Keywords: Benin, Ethnobotanical knowledge variation, Use category, Underutilized species

24. Etude ethnobotanique des ressources forestières ligneuses de la forêt marécageuse d'Agonvè et terroirs connexes au Bénin

Dossou ME, Houessou GL, Lougbegnon OT, Tenté AHB, Codjia JTC

***Tropicultura*, 30 (1) 41-48.**

Abstract

Quantitative ethnobotanical study was conduct with the local community around Agonvè forest, which is one of southern Benin swampy forest. This study enables to describe the different use categories of woody plant species for local population and to determine the use value (UV) of each species. A total of 28 woody species were identified as useful species for the local population in different use categories such as medicine, food, fire wood and construction. The principal component analysis on the matrix (use forms * species) showed that the populations did not generally log the tree species which they considered as useful for food or medicine. There was no significant difference regarding the overall ethnobotanical use value between the surrounding villages ($p = 0.344$, $F = 1.08$ and $dF = 2$). Among the useful species, *Dialium guineense* (UV_T = 8.98), *Spondianthus preussii* (UV_T = 7.68) and *Raphia hookeri* (UV_T = 7.16) were the most use species by the local population. Finally the study pointed out the importance of the ethnobotanical use value as tool to select the species which conservation must be emphasized in the management plans to meet not only the need of the populations but also to improve the conservation statute of the species.

Keys words: Ethnobotany, Use value, Swampy forest, Agonvè, Benin

25. Hemicryptophytes plant species as indicator of grassland state in semi-arid region: case study of W Biosphere Reserve and its surroundings area in Benin (West Africa)

Laurent G. Houessou, Oscar Teka, Madjidou Oumorou, Brice Sinsin

***International Journal of Biological and Chemical Sciences* 6(3): 1271-1280**

Abstract

In semi-arid region managers are facing rapid degradation of grassland. There is a need to determine indicators to be used to detect early change occurring in the grassland for their sustainable management. Thereof, in this study, we explored the reliability of the use of hemicryptophytes as indicator of grassland state in semi-arid region within W Biosphere Reserve and surrounding areas (Benin). Plots of 10 m X 10 m were installed along a land use gradient (from communal lands to the protected area via the buffer zone) in three vegetation types for plant biomass harvesting and hemicryptophytes traits measurement. The hemicryptophyte density, biovolume, tussock size, contact frequency, contribution to total plant biomass

and grassland grazing value were assessed and compared between land uses. Findings showed that hemicryptopyte traits were significantly different with the land use type. Hemicryptophyte biovolume and hemicryptophyte contribution were strongly correlated, respectively, with total biomass production and grazing value. The study highlights the relevance of hemicryptophyte as indicators of grassland state that could be used by grassland managers for grassland monitoring, restoration and sustainable use.

26. Caractérisation phytoécologique et structurale des groupements végétaux de la forêt marécageuse d'Agonvè et de ses milieux connexes au Sud-Bénin

Dossou M. Etienne, Lougbégnon O. Toussaint, Houessou G. Laurent, Teka S. Oscar, Tente A.H. Brice

***Journal of Applied Biosciences* 53: 3821 – 3830**

Abstract

Objectif : Le présent travail se veut être une étude de base pour l'aménagement durable d'un écosystème humide négligé au sud du Bénin : la forêt marécageuse d'Agonvé et ses écosystèmes connexes. Il vise à identifier les différents groupements végétaux de la forêt, à connaitre leur diversité floristique et la structure diamétrique de leurs peuplements ligneux.

Méthodologie et résultats : Les inventaires effectués au sein de la forêt marécageuse et milieux connexes ont permis de discriminer quatre groupements végétaux avec 157 espèces réparties en 54 familles. L'indice de Shannon des groupements végétaux varie de 2,20 et 4,03 bits. Raphia hookeri (45,62%), Nauclea xanthoxylon (26,66%), Pterocarpus santalinoides (23,87%) et Xylopia rubescens (20,7%) représentent les espèces à valeur d'importance élevée au sein de la forêt. L'ajustement des classes de diamètres des groupements à la distribution de Weibull a donné des valeurs de coefficient de forme inférieures à 1.

Conclusion : L'étude phytoécologique et structurale de la forêt marécageuse d'Agonvè a permis de montrer la diversité des groupements végétaux de cet écosystème. Bien que la forêt marécageuse d'Agonvè ne présente pas une très forte diversité floristique, elle regorge de nombreuses espèces floristiques considérées comme menacées sur la liste rouge de l'IUCN du Bénin mais présentant de forte valeur d'importance dans la forêt. Elle apparait comme un écosystème augmentant localement la diversité biologique et nécessite des actions urgentes de conservation.

Mots clés: Forêt marécageuse, relevé floristique, Structure diamétrique des ligneux, Bénin

27. Ethnobotanical study of medicinal plants used for the treatment of malaria in plateau of Allada, Benin (West Africa)

Marius H. Yetein, Laurent G. Houessou, Toussaint O. Lougbegnon, Oscar Teka, Brice Tente

***Journal of Ethnopharmacology* (2012), http://dx.doi.org/10.1016/j.jep.2012.12.022i**

Abstract

Background: Malaria remains one of the most important illnesses in sub-Saharan Africa. In Benin, it constitutes a major public health preoccupation particularly for children and pregnant women. Until now, population still mostly relies on herbal medicine for malaria healing. Hence this study was carried out to document the medicinal plants used in the plateau of Allada in Benin and to assess local knowledge on traditional medicine in the management of malaria and related symptoms.

Materials and methods: Data were collected from 53 informants composed of 23 traditional healers and 30 medicinal plants sellers using a structured questionnaire.

Results: A total of 82 plants species belonging to 78 genera in 43 plant families were recorded as antimalarial in the study area. The families of Rubiaceae and Caesalpiniaceae were the most represented with seven species each. High informant consensus factor (ICF) was recorded in the treatment of malaria (ICF=0.90). High fidelity level (FL=100%) was also recorded for 45.67% of the species used as antimalarial. Dichapetalum madagascariense was the species of high relative frequency of citation (RFC=0.81). The dominant plant parts used in the preparation of remedies were leaves (68%). The decoction (79%) was the main mode of preparation, while oral route (92%) was the principal route of remedies administration.

Conclusion: This study provides plant species used in the plateau of Allada for malaria and related symptoms treatment. We hope that this study could be important for the conservation of traditional knowledge on the antimalarial plants and the improvement of malaria management. However, several plant species used as antimalarial by the traditional medicine practitioners in the study area need to be screened in order to identify the species having antiplasmodial activity.

Keywords: Informant consensus factor, Fidelity level, Medicinal plants, Ethnobotany, Rubiaceae

28. Change in the woody floristic composition, diversity and structure from protected to unprotected savannahs in Pendjari Biosphere Reserve (Benin, West Africa)

Thierry D. Houehanou, Romain L. Glèlè Kakaï, Achille E. Assogbadjo, Valentin Kindomihou, Marcel Houinato, Rüdiger Wittig, Brice A. Sinsin

African Journal of Ecology **DOI: 10.1111/aje.12046**

Abstract

Savannahs are widespread vegetation type in Sudanian zone of Africa. As protected areas are often assumed to be the best way to conserve biodiversity, we assessed the effectiveness of the Pendjari Biosphere Reserve in Benin, for maintaining savannah woody species composition, diversity and structure. Square plots of 900 m^2 were randomly established in protected and surrounding unprotected savannahs, and all woody species ($dbh \geq 1$ cm) were recorded and identified. Species composition, Importance Value Index, densities, basal area and diversity indexes were assessed in relation to conservation status. The results showed that DCA based on presence/absence species data did not separate clearly protected savannahs from unprotected ones. However, some species were prominent in unprotected savannahs while others showed the same scheme in protected ones. Diversity indexes indicated a good distribution of species in the two savannah types. The woody density showed a higher value in protected than unprotected savannah at shrub layer level. The basal area was significantly higher in the protected savannah than unprotected one at the two woody layer levels. It can be concluded that biodiversity conservation in surrounding unprotected areas should be of great importance to increase biodiversity conservation by protected area whether specific actions were implemented

Keywords: conservation; diversity; savannah; structure; woody species

29. Le calendrier pastoral en élevage extensif dans le Nord-Est du Bénin : un outil de gestion du cheptel bovin de l'exploitation

Jonas André Djenontin1, Oumorou Madjidou2, Marcel Romuald Houinato3, Guy Apollinaire Mensah4, Brice Augustin Sinsin

***Sécheresse*. Volume 23, Numéro 4, 261-70**

Abstract

The economic management of herds nowadays imposes development of policies articulated around the complex herd-environment. It is necessary to figure out how this complex functions, just as it is important for herders to seek harmony with their environment as a key objective for all stakeholders in this sector. The analysis of the environmental frame highlights some favourable conditions for the development of cattle herding. All cattle herders' strategies should allow them enough space for their activity, whether at the level of their origin country or in neighbouring areas, which can be regional or national. Their behaviour also is established upon their fine knowledge of the vegetation in different parts of the pastoral lands and relies on indicators of fodder species availability according to seasons in North-East Benin and neighbouring regions. The vegetation units used as rangelands cover natural grasslands in savannas and woodlands. The temporal and spatial evaluation of the physical state of the herds and animals makes it possible for herders to build the itineraries of rangelands and to determine the convenient periods of their exploitation on the basis of the pastoral calendar.

Keywords : calendar, cattle, herd, movement, nutritional condition

30. Diversité et caractérisation morphologique des écotypes de l'espèce fourragère Panicum maximum au Bénin

S. ADJOLOHOUN, M. DAHOUDA, C. ADANDÉDJAN, S.S. TOLEBA, M. HOUINATO, R. NONFON et B. SINSIN

***Int. J. Biol. Chem. Sci.*, 6(5): 2043-2054.**

Résumé

Panicum maximum est une espèce fourragère très polymorphe répandue en Afrique tropicale. Une meilleure connaissance de sa diversité contribuera à son amélioration et à son utilisation. Cette étude a été réalisée en 2008 dans la zone Ouest Africaine sur des souches autochtones et porte sur 70 accessions de l'espèce collectées dans différentes zones agro-écologiques. Elles

ont été installées selon un écartement de 1 m sur 1 m dans un dispositif de blocs complètement aléatoire sur des parcelles de 4 m × 4 m répétées 3 fois. Des données concernant quatorze caractéristiques dont 01 géographiques, 09 morphologiques, 02 agronomiques et 02 physiologiques ont été collectées et analysées en composantes principales. Les résultats ont montré que les trois premières composantes ont absorbé 85,3% des variations totales. La classification numérique a permis d'identifier 9 écotypes (R2 = 87%) présentant entre elles des différences significatives ($p < 0,05$). La hauteur des plants varie de 123 à 430 cm, le tallage des plants est compris entre 33 et 77 talles par touffe, le diamètre des talles mesure 4 à 7 mm, le nombre de feuilles par talle est de 7 à 12 unités. La floraison des accessions apparaît entre 6 et 13 semaines après installation. L'étude a identifié d'une part des écotypes résistants à la sécheresse et d'autre part des écotypes présentant des caractéristiques conférant des potentialités au plan agronomique. Enfin, les différentes corrélations observées entre les caractéristiques ont montré qu'il est possible d'améliorer par des croisements les performances de l'espèce aux fins de sa production fourragère.
Mots clés: Herbe de Guinée, écotypes, accessions, caractéristiques, Bénin.

31. Valeur pastorale des parcours naturels en zone soudano-guinéenne et stratégie paysanne d'adaptation aux effets de leur invasion par Chromolaena odorata au Bénin

AB ABoh, S Babatounde, M Oumorou, M Houinato, B Sinsin
***Int. J. Biol. Chem. Sci.* 6(4): 1633-1646.**

Abstract

Cette étude sur les pâturages naturels envahis par Chromolaena odorata a été réalisée dans la zone de transition guinéo-congolaise/soudanaise du Bénin. L'objectif de l'étude est d'analyser les connaissances endogènes, les paramètres biologique et agronomique pouvant permettre de déterminer l'effet de l'invasion de C. odorata sur le potentiel pastoral. Les valeurs du coefficient de similitude de Jaccard (<50%), montre que les pâturages aux différents stades d'invasion ne sont pas similaires. La richesse spécifique est plus élevée au niveau des pâturages aux stades 1 et 2 d'invasion. La phytomasse des graminées a varié de 0,37 à 5,62 t MS/ha. Elle est plus élevée dans les pâturages au stade 1 d'invasion. La valeur pastorale (1,12 à 56,9) et la capacité de charge (0,00 à 0,83 kg MS/ha) diminuent avec l'intensité d'invasion par C. odorata. Les éleveurs disposent des connaissances endogènes sur la biologie de C. odorata et adaptent des stratégies d'élevage. Les critères de choix des espaces à pâturer sont par ordre de classification: les graminées consommées sans hésitation, les graminées consommées occasionnellement, le volume et l'accessibilité aux ressources fourragères. Le niveau d'invasion peuvent servir d'indicateurs essentiels de la qualité fourragère des parcours envahis en l'absence de toute analyse bromatologique.

32. Effets de l'incorporation de la farine de feuilles de Cassia tora (Linn.) dans la ration alimentaire sur les performances de croissance, les caractéristiques de la carcasse et des organes et le résultat économique chez des jeunes poulets traditionnels du Sénégal.

AYSSIWEDE S. B., MISSOKO-MABEKI R., MANKOR A., DIENG A., CHRYSOSTOME C. A. A. M., HOUINATO M. R., MISSOHOU A. et HORNICK J. L.
***Revue Méd. Vét.*, 163, 8-9, 375-386**

Abstract

The aim of this study carried out from October 2010 to January 2011 was to evaluate the effects of *Cassia tora* leaves meal inclusion in the diet on growth performances, carcass and organs characteristics and economics results of indigenous Senegal chickens. Eighty eight (88) indigenous Senegal chicks of 6 weeks old were randomly divided into four groups of 22 chicks each with similar body weight. Each group allotted in two repetitions of 11 birds, corresponded to four (4) dietary treatments CT_0, CT_5, CT_{10} and CT_{15}containing respectively 0, 5, 10 and 15% of cassia leaves meal in substitution of groundnut cake meal. During the trial (7-18th week old), zootechnical parameters of birds and economical data were recorded, processed and analyzed per dietary treatment. From 7 to 18 weeks old, the final live body weights (LBW) were 694.36 g, 880.41 g, 763.14 g and 708.64 g/bird, the average daily weight gain (ADWG) were 5.6 g, 7.81 g, 6.4 g and 5.73 g/day, the daily feed intake (DFI) of 25.66 g, 31.02 g, 34.64 g and 32.51 g/bird and the feed conversion ratio (FCR) of 5.83, 4.79, 7.44 and 8.87 respectively for birds fed CT_0, CT_5, CT_{10} and CT_{15} diets. The *C. tora* leaves meal inclusion up to 15% in the diet did not cause any adverse impact on LBW, ADWG, DFI, mortality, carcass and organs characteristics of these birds compared to their controls. Except for the significant FCR deterioration in birds of CT_{10} and CT_{15}, significantly better growth performances, feed costs and economic margins were recorded with birds fed the CT_5 diet, making thus of this last treatment the single most economically profitable (+205 FCFA/kg carcass of additional) compared to control.

Key words:growth performances - feeding - economical margin - indigenous chickens - cassia leaves - carcass and organ characteristics - Senegal

33. Poverty and agroforestry adoption: the cases of Mucuna pruriens and Acacia auriculiformis in Godohou village (Southern Benin)

Emile N. Houngbo*, Anne Floquet2 and Brice Sinsin3

***Journal of Life Sciences* 6 (2012): 794-800, USA.**

Abstract

The decomposition of the environmental degradation cost in Benin Republic revealed that the agricultural activities are responsible of the greatest amount of this cost (76.1 %). This situation is strengthened by the fallow periods shortening (and even suppression) in the southern Benin in general, because of demographic pressure. The promotion of some improved fallow technologies (IFT) was then launched some decades ago. This study focused on two IFT of high agro-ecological value, Mucuna pruriens and Acacia auriculiformis, in order to determine the influence of the farmers' wellbeing state on their farming systems in general, and on the adoption level of these two technologies in Godohou village (southern Benin). The data analysis revealed that:

- There was no significant difference between the farmers' amount knowing the agronomic and ecological value of Mucuna pruriens and Acacia auriculiformis from a level of prosperity to another.
- Three wealth levels were distinguished: The poor class (Ayatonon class), the less poor class (Metchivo-Houedeka class) and the non poor class (Hotonon class) which represented respectively 35.4 %, 55.9 % and 8.7 %.
- The adoption rate of Mucuna and Acacia fallow was globally low in Godohou village (25.7 %), but this adoption rate was lesser in the poorest class than in all other classes. This trend was confirmed if we integrate a global agro-ecological analysis of the farming systems practiced by the farmers.

***Key words**: Godohou, Poverty, Environment, Mucuna, Acacia, Adoption, Level of prosperity.*

34. **Gender and chronic poverty in rural Benin**

Houngbo, N. Emile; Mongbo, Roch; Homèvo Agossa, Christophe; Djègo, Julien; Kindomihou, valentin, Floquet, Anne & Sinsin, Brice

***Cahiers du CBRST 2* : 147-165, Dossier Société, Environnement et Développement, Cotonou (Benin)**

Abstract

Some research findings revealed that poverty rate in Benin Republic is higher in rural area and within the women, without specifying the forms of poverty; what does allow targeted policy which is recommended nowadays for an efficient struggle against poverty. This study aimed at filling up this knowledge gap in rural area. This study was implemented in the Adja plateau (Department of Couffo), southern Benin. From a sample of 122 households, the quantitative analysis of poverty dynamics on the period 2000-2007 allowed identifying 35 chronic poor households, say 28.7 percent. This quantitative approach was completed with life history analysis of four representative chronic poor households, two households headed by men and two households headed by women. This paper presents the findings specific to chronic poor households that revealed that:

- There's a disparity of the forms of poverty as far as the households headed by men and that headed by women were concerned. The chronic poverty rate is higher in the women headed households than in that headed by men: 47.1 % versus 25.7 %. Chronic poverty dominated transient poverty in the women headed households, while it is the contrary in the households headed by men.

- Chronic poverty depended on economic and socio-cultural structures that affect negatively the households' production capacity. It generally proceeds of the repetition of negative events that weaken and reduce the households' capacity to support the chocks or to take advantageous of positive events: deaths, sicknesses, drought, etc. The households headed by women must face moreover the perverse weight of socio-cultural norms which weaken them: exclusion of land inheritance, obligatory inactivity after the death of a child or the husband, etc.

For efficient fight against poverty in rural Benin, priority must be given to the worst form of poverty - the chronic poverty - with a particular attention to the households headed by women who are more exposed to it. This imposes structural policies such as the social covering of healthy, the sets reinforcement for the households and the promotion of the household headed women.

Keywords*: Chronic poverty, Transient poverty, Gender, Life history, Benin*

35. Could Sacredness Contribute to Forestry Biodiversity Conservation in African Urban Areas?

Houngbo, N. Emile*1, Orekan, Vincent2, Djego, G. Julien3 & Sinsin, Brice4

***Annales des Sciences Agronomiques,* Abomey-Calavi (Benin) (in press)**

Abstract

A great place is presently attributed to forest because of its potential for carbon sequestration. More than rural forest, urban forest is of greater utility because of its capacity to serve as a natural laboratory for pedagogic activities of several schools. Paradoxically, it's observed in Benin an annual deforestation rate of 1.2%, greater than the 1 % rate for the West Africa Sub region. One wonders if sacredness, the oldest traditional practice of protection in Africa, could increase the urban forests resistance to human pressure. A case study applied to the classed forest of Kilir (Djougou District) in the northern Benin, and the classed forest of Abomey (Abomey District) in the centre of Benin, revealed that:

- From respectively a size of 50 ha at the classing in 1949 and a size of 173 ha at the classing in 1941, 70 % of the forest of Kilir and 43.4 % of the forest of Abomey are destroyed;
- The remain parts of both the two forests shelter specific sacred spaces;
- No part of the sacred spaces of the two forests was destroyed.

Sustainable management of urban forests in Africa needs then to value sufficiently the sacred powers.

Key words*: Sacredness, Urban Forests, Biodiversity, Abomey, Kilir, Benin.*

36. Soil factors affecting density of three giant land snail species in different habitats of Dassa Zoumé district (central Benin)

RODRIGUE IDOHOU, CHABI A. M. S. DJAGOUN, ACHILLE E. ASSOGBADJO AND JEAN T. CLAUDE CODJIA

***Molluscan research* ISSN: 1323-5818 (under review)**

Abstract

This study examined the environmental factors affecting the density of the exploited giant land snail species, Archachatina marginata (Swainson 1821), Achatina fulica (Bowdich 1822) and Limicolaria flammea (Muller 1774) in the Dassa Zoumè district of Benin. Thirty plots of 30 m X 30 m were laid out, within four vegetation types (fallows, forest, woodlands and wood savannah). Inside each plot the numbers of each giant land snail species were counted, and soil characteristics were measured. ANOVA and generalized linear models (GLMs) with Poisson distribution were used to examine the influence of soil factors on the giant land snails. *A. fulica* has the highest mean density (507 snails/ha) while *A. marginata* has the lowest density (110 snails/ha). ANOVA showed no significant difference in density among habitat types for any species. The most parsimonious GLM model showed that the abundance of *A. fulica* was positively associated to the fine sands, fine silts and pH while the interactions were negatively associated with the abundance of the species. The abundance of *L. flammea* was negatively associated to the fine sands, fine silts and pH while the interactions were positively associated to the abundance of the species. As for *A. marginata*, the abundance was negatively associated to the fine silts, pH and litter while the interactions were positively associated to the abundanceof the species. The abundance pattern of forest molluscs is likely to be affected by different processes. Exploitation of these giant snails will affect their density, and further research is needed to establish appropriate levels of harvesting and habitat management.

Key words: Abundance, land snail, soils parameters, habitat, Benin

37. Ethnobotanique et Importance socioculturelle de *Artocarpus altilis* (Parkinson) Fosberg (arbre à pain) au Sud-Bénin

Gaston AKOUEHOU, Cédric A. GOUSSANOU, Rodrigue IDOHOU

***Annales des Sciences Agronomiques* (under review)**

Résumé

La présente étude a porté sur l'importance socioculturelle de l'arbre à pain (*Artocarpus altilis*) au Bénin, l'une des 10 espèces ligneuses alimentaires sur lesquelles une attention soutenue et des actions prioritaires doivent être menées sur la base de leur importance socioéconomique. Elle a été effectuée dans le district phytogéographique de Pobè. Les données ont été collectées dans les communes de Adjohoun, Dangbo et Akpro-Missérété Le choix des informateurs dans chaque localité s'est faite de façon aléatoire. Un sondage sur une population de 50 personnes prises au hasard, lors de la phase exploratoire a permis de déterminer la taille de l'échantillon. Les informations collectées sont relatives aux noms locaux de l'espèce, les différentes

utilisations, les lieux de prélèvement et le mode de gestion. Pour évaluer l'importance socioculturelle de *A. altilis* suivant les communautés, trois différents paramètres sont calculés (indice de diversité de l'enquêté, indice d'équitabilité de l'enquêté et la valeur consensuelle pour les types d'utilisation). Les enquêtés ont été répartis par groupes socioculturels et par genre. Un total de 6 sous-groupes a été constitué. Ce sont : Homme Wémènou (HW), Femmes Wémènou (FW), Hommes Holli (HH), Femme Holli (FH), Hommes Fon (HF) et Femmes Fon (FF). Afin de mieux décrire les relations entre les valeurs d'utilisation des organes et les ethnies considérées, une Analyse en Composantes Principales (ACP) a été effectuée en utilisant le logiciel SAS 9.1. Les résultats indiquent que *Artocarpus altilis* est une espèce bien connue des populations locales qui détiennent plusieurs connaissances sur ses utilisations. Mais, les connaissances des populations sur les utilisations de l'espèce sont inégalement réparties. Les fruits de *A. altilis* sont consommés après cuisson accompagnés souvent de niébé. Tous les interviewés (100 %) confirment cette forme d'utilisation des fruits de l'espèce pendant que 86 % reconnaissent l'utilisation du tronc comme combustible. D'autres utilisations comprennent l'artisanat et la construction. L'utilisation de l'espèce la moins renseignée dans le milieu est celle médicinale. Six types d'utilisation sont reconnus à l'espèce. Ce sont : alimentaire, médicinale, bois de feu, construction, artisanale et comme fourrage. Parmi ces différents types, l'utilisation alimentaire (CTU=0,317) apparait comme la plus importante. Il a été aussi remarqué que les pieds d'*A. altilis*ont leurs propriétaires. Ces derniers possèdent tous droits d'usage sur ces pieds et peuvent les céder (louer ou les vendre) à qui ils veulent.
Mots clé :*Artocarpus altilis*, Ethnobotanique, Bénin, types d'utilisation.

38. The MDGs Realization in Benin: Rural Poverty Variation and its Influence on Land Conservation

Emile N. Houngbo, Valentin M. KINDOMIHOU, Roch MONGBO, Anne FLOQUET & Brice A. SINSIN

***Annales des Sciences Agronomiques,* Abomey-Calavi (Benin) (under review)**

Abstract

The Benin Millennium Development Goals (MDGs) were particularly focused on poverty eradication and the struggle against natural resources degradation. After seven years of implementation, it's necessary to evaluate the progress realized and to define the adjustments necessary for the goals realisation in the target year, 2015. This study has been implemented in the Couffo Department, one of the two Departments most affected by poverty and environment degradation in Benin. From a sample of 122 households extracted from that constituted during the Study on the Life Conditions in Rural area realized in 1999-2000 in Benin, this study aims at analysing in the Adja plateau, the main agricultural zone of the Couffo Department, poverty variation during 2000-2007 period and its effects on the global level of land conservation agricultural techniques practice. With the poverty and pro-poor growth indexes and the test of the variation in the indicators of land conservation agricultural techniques practice, we remarked that all the poverty indexes have decreased during 2000-2007. This decrease associated with a pro-poor growth has induced a significant increase in the agricultural land size under conservation agricultural techniques. The trends are then favourable to the realisation of the targets 1 and 9 of the Benin Millennium Development Goals in 2015. But the goals 1 and 7 will not reached.
Keywords: *Benin, Poverty Index, Pro-Poor Growth, Land Conservation, Adja plateau.*

39. Current floristic composition, life form and productivity of the grasslands in the Hunting Zone of Djona (Benin)

Myrèse C. Ahoudji, Oscar.Teka, Jorgen. Axelsen, Marcel. Houinato

Abstract

Objectives: This paper addressed temporal changes in floristic composition, plant communities' structures and productivity of grasslands. The study was conducted in the Hunting zone of Djona in the Transboundary Biosphere Reserve of W (TBRW) Benin. *Methodology and Results*: For these purpose 30 plots of 900m² were used and "phytosociological relevés" were done following ecological uniformity, floristic homogeneity and samples representativeness to established plants communities. For biomass estimation, 30 plots of 100 m² were used. Results showed that the greatest productivity value (8320 ± 0.21 kg DM/ha) was observed in Andropogon gayanus-Schizachyrium sanguineum grassland. The dominant life forms in all plants communities of the study area are the phanerophytes followed by therophytes. For chorological types, all plants communities are dominated by the species of the Sudanian base element and species with broad distribution. *Conclusions and application of findings:* The identified life forms and chorological types showed an evolution of the post farming pastures to woodlands and savannas vegetation, which explains the current floristic composition of the area. Moreover, it will be possible to model the impact of grasslands exploitation on the viability of the protected area particularly in the context of climate change and for this, it's important to undertake a long-term study in order to take into account all variations and all causes of these variations.
Key-words: Grasslands, productivity, floristic composition, protected area, Benin.

40. Contribution to efforts to protect the Transboundary Biosphere Reserve in the vegetation dynamics

Myrèse Ahoudji, Roel Houdanon, Belarmain Fandohan, Oscar Tèka, Marcel Houinato, Jorgen Axelsen, Brice Sinsin

Abstract

Rangeland vegetation of the period before intensification of protective measures was compared to those based on 10 years of intensification of protective measures (2002 and 2012). To reach the objectives fixed of our survey, 32 summaries phytosociologiques has been achieved according to the method of Braun-Blanquet in plots of 900 m2 within the plant formations sheltering the installed permanent placeaux since 2002 by the LEA (Laboratory of Applied ecology).. An NMS (Nonmetric Multidimensional Scaling) performed on the two matrices surveys (2002 and 2012) allowed the discrimination of three plant communities to the matrix of 2002 and three plant groups for the 2012 matrix. These plant communities were characterized by their pastoral value. Analysis of life form and chorological spectrum revealed the predominance of phanerophytes, therophytes and hemicryptophytes and the species of the Sudanian base element, most of them allying to the local flora (sudanian species). The dominance of phanérophytes reveals a reduction of the anthropic pressures on rangeland and the one of the element bases soudanien testifies the adherence of our survey zone to the Sudanian area. Similarly, the high values of these pastoral grazing shows a marked improvement in the quality of the components of these pastures. The overall diachronic analysis proves that there is evolutionary dynamics of the flora of the RBT-W and therefore that the rangelands have suffered a net decrease of anthropogenic pressure in recent years of 2002 study.

Key words: Change of the rangeland, RTB-W Benin, phytosociological plots, structure in diameter.

41. How far bowalization affects phytodiversity, life forms and plant morphology in Sub-humid tropic in West Africa

Elie A. Padonou, Achille E. Assogbadjo, Yvonne Bachmann, Brice Sinsin

***African journal of ecology* (in press)**

Abstract

Bowal or ferricrete, the final of land degradation, occurred only in tropical region. This study aimed at assessing effects of *bowalization*on phytodiversity, life forms and morphological response of plant species using *Combretum nigricans*Leprieur ex Guill. & Perr.as a case study. Morphological parameters (height, number of stems, number of branches, diameter at breast height and crown diameter) of *C. nigricans* were carried out in the sub-humid zone of Benin. Plant communities were determined according to Multi-Response Permutation Procedures analysis. Plant communities were more diversified on sand-clay and concretion soils (control) compared with those described on *bowal*. *C. nigricans* developed more stems (3.6 ± 1.4 stems vs. 1.3 ± 0.4 stems), more branches (5.9 ± 2.4 branches vs. 3.2 ± 0.6 branches) and large crown diameter (5 ± 1.48 m vs. 3.4 ± 1.2 m) on *bowal* than on sand-clay soil. The best adapted life forms on *bowal* were therophytes. *Bowalization* induced loss of phytodiversity, changes in species life forms and provoked local adaptation of tree species.

Keywords: *bowal*, phytodiversity, life forms, *Combretum nigricans*, Sub-humid zone, Benin.

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42. How farmers perceive and cope with bowalization: a case study from West Africa (Benin)

Elie A. Padonou, Belarmain Fandohan, Yvonne Bachmann, Brice Sinsin

***Annale des Sciences Agronomiques* (In press)**

Abstract

Bowal, the final of land degradation, occurred only in tropical region. This study aims at assessing farmers' perceptions on the causes and consequences of bowalization and strategies to cope with it in semiarid and sub-humid climate zones in Benin. Data were gathered using semi-structured interviews and questionnaires. The Pearson Chi_square Test was performed to evaluate the answers given on causes, consequences and coping strategies to bowal. Simple correspondence analysis was used to assess coping strategies according to ethnic groups. Bowalization was reported to be induced by non adapted land use and soil erosion. An increase of farmed land and tillage with animal was more obvious in the semiarid zone.

Bowalization induced loss of biodiversity in the two climates zones. Its consequences on crops production were mainly lack of water, difficulty of crops rooting, increasing of soil temperature and need to modified cropping techniques on bowal. Some farmers in semiarid zone have adopted cowpea and groundnut on bowal. On strategies develop to change cropping

technique, farmers have adopted hoe for manual tillage and weed control in semiarid zone. On livestock herding, the strategies adopted were transhumance and use of food supply. Bariba and Dendi ethnics groups were those that mostly modified their practices of tillage, controlling weed, sowing, fertilizing, and feeding of livestock. Mahi, Holli, Fon and Adja ethnics groups have mostly practiced farmland reduction, moving of crops, changing of plots and new off-farms activities. Peulh have mostly practiced transhumance.

Keywords: Bowal, Perception, coping strategies, Climate zones, Benin.

43. Spatial distribution of bowal and differences in physicochemical characteristics between bowal and forest in the context of restoration in Benin,West Africa

Elie A. Padonou, Yvonne Bachmann, Romain Glèlè Kakaï, Brice Sinsin

Land Degradation and Development **(under review)**

Abstract

Bowalization, a particular form of land degradation leads to the lateral expansion of ferricrete horizons. This study aims at assessing the spatial distribution and analyzing the physicochemical characteristics of *bowal* soils in comparison to forest soils in the context of restoration. Geographical coordinates and soil samples of *bowal* were collected on *bowal* sites and in forests of the phytogeographical districts where *bowal* occur. The projection of *bowal* coordinates to the phytogeographical districts of Benin and to a soil map was undertaken to assess the relationship between the characteristics of soils and the occurrences of *bowal*. Principal component analysis was used to assess the difference of physicochemical characteristics between the phytogeographical districts where *bowal* occur. T-tests were used to test the differences between the physicochemical characteristics of *bowal* and forests. *Bowal* was found in six of the ten phytodistricts of Benin. *Bowalization* was found to be associated with ferruginous soils. *Bowal* with the highest value of organic matter, phosphorus, total N and silt and the lowest value of potassium were located in the phytogeographical districts of Noth-Borgou, Atacora chaine and Mekrou. *Bowal* from Mekrou-Pendjari, Atacora chaine, South-Borgou and Zou had the highest values of EC, pH and sand and the lowest value of clay. *Bowal* has significantly lower electrical conductivity, organic matter**,** extractable Phosphorus, silt and total N than forest soils, but potassium exchangeability was higher. *Bowal* may be restored with compost or agroforestry systems with appropriate cropping techniques.

Keywords: *Bowal*, phytogeographical district, ferruginous soil, physicochemical characteristics, West Africa

44. Process analysis in the coastal zone of Bénin through remote sensing and socio-economic surveys

Oscar Teka, Ulrike Sturm-Hentschel, Joachim Vogt, Hans-Peter Bähr, Stefan Hinz, Brice Sinsin

Ocean & Coastal Management **67 (2012) 87-100**

Abstract

Migration and population growth lead in coastal zones, especially in developing countries like Benin in Western Africa, to extreme land use pressure, causing ecological as well as land cover and land use changes, socio-economic modifications, and conflicts of interest and generational conflicts. To detect those fast-moving processes area-wide remains almost impossible in developing countries due to the lack of official statistics, often restricted remote sensing data, and limited financial resources. Due to that lack of data, methods using representative samples and indicators are required. In order to detect and comprehend ongoing spatial processes in the coastal zone of Benin, available heterogeneous remote sensing data were analyzed and surveys were conducted. The processes of migration, agricultural dynamics, and coastal changes were identified and investigated through relevant indicators. By the use of remote sensing, the spatial expression of the complex process-structures can be detected in terms of changes, while socio-economic, demographic, and cultural analysis helps uncover and explain reasons for and settings of the observed changes. Findings such as those obtained constitute a prerequisite for coastal resources management and provide an important planning tool for decision makers.

45. Assessment of Climate Variation Risks on Agricultural Production: Perceptions and Adaptation Options in Benin

Oscar S. Teka, Gbenato Laurent Houessou, Madjidou Oumorou, Joachim Vogt and Brice Sinsin

International Journal of Climate Change Strategies and Management **(IJCCSM)**

Abstract

The purpose of this paper is to assess the local communities' perception of climate variation effects on crop production and the adopted strategies by farmers in order to cope with the negative of climate on the agriculture in the coastal zone of Benin.

A total of 290 agricultural households was sampled and surveyed through structured interviews. The Principal Component Analysis (PCA) was performed on the relative frequencies citation of perceived climate variation indication in order to describe the relationship between risk perceptions according to socio-demographic characteristics. The relative frequency of citation was calculated according to age, gender, ethnic group and agro-ecological region. Results showed that almost 83% of the respondents already perceived the climate change risks through several indications. Climate variation perception varied with respect to age. Respondents' opinion regarding climate variation causes depended generally on their age, religion and level of education. As far as climate variation risks impact on crop production is concerned, the respondents' opinions diverged. The assessment of local communities' perception is important to design participatory and sustainable measures to cope with harmful effects of climate variation on crop production.

Key words: Climate variation, Crop production, Perception, Adaptation, Tradition, Benin

46. Mangrove Degradation and Endogenous Strategies for Participatory Restoration and Conservation in Benin

Teka Oscar, Houessou G. Laurent, Lougbegnon O. Toussaint, Oumorou Madjidou & Sinsin Brice

Journal of Sustainable Development **(in press)**

Abstract

Mangrove ecosystem represents an important coastal resource, which is vital to the livelihood of local communities. Due to the high anthropogenic pressure, mangroves ecosystems are overexploited and degraded. The present investigation was undertaken in three Districts from the coastal area of Benin in order to understand the relationship human-mangrove and to provide baseline information for its sustainable management. Two types of surveys were conducted from November 2011 to February 2012: the survey of the population (180 structured interviews) and of responsible persons in public office (19 semi-structured interviews). The interviewees were randomly selected from three Districts. Mangrove use value was assessed and non parametric test was used to test the statistic difference of the mangrove use value between socio-demographic characteristics. Principal Component Analysis was applied for the analysis of endogenous strategies for mangrove conservation/restoration and helped to describe the relationship between proposed endogenous strategies according to the different socio-demographic traits of informants. The Beninese mangrove supplies fuel and service wood, forage, fishery products, medicinal plant species and cooking salt for local communities. Mangrove areas are also used for agricultural purposes and human settlements. Findings showed significant difference in mangrove use categories between the Districts. Regarding the gender, significant difference was observed for fuelwood, service wood and salt production. Differentiation between ethnic groups for salt production and fishery purpose was observed. Nonetheless, perceived mangrove degradation by local population did not significantly vary from one District to another. Local communities are aware of the necessity for the restoration and sustainable conservation of the mangrove. Various restoration and conservation measures were suggested according to socio-demographic characteristics of informants.

Keywords: Mangrove, degradation, endogenous strategy, gender differentiation, Benin

47. Topographic and edaphic factors determining Chromolaena odorata and Hyptis suaveolens invasion of grassland in the Guineo-Congolian/ Sudanian transition zone (Benin)

Boya André ABOH, Oscar TEKA, Madjidou OUMOROU and Brice SINSIN

African Journal of Ecology **(under review)**

Abstract

This study analyzed the main edaphic factors determining the spatial distribution of two alien species: Chromolaena odorata and Hyptis suaveolens. For this purpose, data were collected in 33 plots which were randomly selected. Inside these plots, phyto-sociological relevés were carried out according to Braun-Blanquet method. The Canonical Analysis of Correspondence was applied for data analysis. However, soil samples were also collected in the plots and analyzed. Results showed that wet grasslands on floodplains at the contamination step were distinguished from dry plateaus grasslands. Regarding contamination levels of both alien plants, a significantly difference was also observed. The pH, the potassium content, the sandy and carbon rates represent most important factors explaining the development of alien plants in dry plateau grasslands. At the same time, clay, silt, phosphorus, calcium and magnesium as well as cation exchange capacity are the main factors for the invasion of the studied alien plants on floodplain grasslands. It could be concluded that soil characteristics determine the invasion speed and the floristic composition of the investigated savannah. Dry plateau soil and oligotrophe soil favored the development of Chromolaena odorata and Hyptis suaveolens. Therefore, it was suggested planning activities to prevent the expansion of these species on dry plateau grasslands.

Key words: Alien plants, Canonical analysis of correspondence, plant communities, soil characteristics

48. Etude de base pour l'aménagement des terres de parcours dans la commune de Malanville en zone soudanienne du Bénin

LOUGBEGNON O.T, DOSSOU M.E., HOUESSOU G.L. et TEKA S.O.

Revue de géographie de l'Université de Ouagadougou **N°00- octobre 2012**

Abstract

This study aims at proving the basic data for sustainable management of the grassland in the District of Malanville. These pasturelands are object of permanent conflicts between sedentary and transhumant breeders. Hence, it is necessary to capitalize the primary data on pastureland management and use in order to implement a pacific use of the pasturelands. The study was carried out through participatory determination of communal grasslands, classification of plant communities in those grasslands, their productivity assessment and carrying capacity assessment through phytosociological relevés and biomass harvesting. Overall, three communal grassland reserves were participatory retained namely two reserves in depression zone (Money Banda and Sakara) and one on plateau (Adani Bangou). The mean productivities are respectively about 3.11 t DM.ha^{-1} for the grassland reserves of Money Banda and Sakara and 0.3 t DM.ha^{-1} for the grassland reserve in Adani Bangou. The ecological carrying capacity of the three reserves is approximately 394 UBT. The observed animal charges in those three reserves are higher than their ecological acceptable capacity. As results, grasslands in the reserve are degraded as evidenced by the higher occurrence of Guieria senegalensis mainly in the plateau grasslands.

Key words: Grassland reserves, productivity, Grassland management, Malanville

49. Diversité des mammifères sauvages de la forêt marécageuse d'Agonvè et des zones connexes et déterminants socio-économiques de leur exploitation

LOUGBEGNON O. Toussaint ; DOSSOU M. Étienne & HOUESSOU G. Laurent, TEKA Oscar

Abstract

The present study lies within the scope of the search for a better knowledge of the mammals and socio-economic analysis of the factors which are at the base of the exploitation of the wild mammals of the marshy forest of Agonvè. Direct and indirect observations on the ground by the recess made it possible to make an inventory of the mammals. The socio-economic investigations by questionnaire on a basis of 132 selected people in a random way were carried out for the socio-economic study of the determinants which influences the exploitation of the resources. The data resulting from the inventory were subjected to a factorial analysis correspondence (AFC). To identify the socio-economic factors which influence the exploitation of the mammals a logistic regression was carried out on the socio-economic data. On the whole 23 species belonging to 13 families still exist in these ecosystems. The coefficients of similarity of SØRENSEN exits of the combination two to two of the ecosystems show that there is not a very strong similarity between fauna mammalian of the various ecosystems ($K < 50$ %). The analysis of logistic regression shows that the variables like the sex, the standard of living, the level of schooling and the size of the household were significant with the threshold of 5 % ($P < 0.05$). The swampy forest of Agonvè abounds in many species of mammals of patrimonial interest (key species and indicator) and of tourist interest like Tragelaphidae, Cercopithecidae, Suidae and bovidae is more pledged with the marshy forest. It is urgent to preserve the biodiversity of the wetlands of the marshy forest of Agonvè.

Key words: Mammal, swampy forest, socio-economic factors, Agonvè, Benin

50. Variation of Loranthaceae impact on Vitellaria paradoxa C. F. Gaertn. fruit yield in contrasting habitats and implication for its conservation

Thierry D. Houehanou, Valentin Kindomihou, Tariq Stevart, Brice Tente, Marcel Houinato & Brice Sinsin

Fruits **(in press)**

Abstract

Introduction Shea tree (*Vitellaria paradoxa* C.F. Gaertn.), a species endemic to the Sudanian savannas woodlands, is dominant in the parklands of West Africa and is of great socioeconomic importance. However, shea tree has been reported in recent decades to be threatened by plant parasites, Loranthaceae. This study aimed to assess possible variation of the impact of these parasites on shea tree fruit yield in two contrasting habitats. Material and Methods 41 weakly and 41 heavily infected shea tree individuals with similar size were selected in protected area as well as in its adjacent parklands. Shea tree traits such as diameter at breast height, canopy diameter, tree height, canopy height, number of fruit yielded, number of parasite stumps and a built impact index ratio were assessed on each shea tree individual. Two-way ANOVA was performed to compare parasite impact on shea tree fruit yield in relation to habitat. Hierarchical cluster, canonical discriminant and One-way

ANOVA analyses were used to show quantitative traits that characterize shea tree group from habitat. **Results** Loranthaceae did not impact fruit yield significantly either in parklands or in protected area. Quantitative traits tended to discriminate all pooled shea trees in relation to habitats. Shea tree individuals in parklands were characterized mostly with highest value of number of infection stumps (n) and impact index ratio suggesting that many shea tree individuals in parklands were sensitive to Loranthaceae impact on its fruit yield. **Conclusion** These findings were helpful to implement some shea tree conservation plans.
Key words: Parasite, shea tree, Parkland, Protected area, Conservation, Sudanian Savanna

51. Tree plantation will not compensate natural woody vegetation cover loss in the Atlantic Department of southern Benin

Toyi Sêwanoudé Scholastique Mireille, Barima Sadaiou Yao Sabas, Mama Adi, Andre Marie, Bastin Jean-François, De Cannière Charles, Sinsin Brice & Bogaert Jan.
Tropicultura **(in press)**

Abstract

This study deals with the process of land-use and land-cover changes for a 33 years period. We assessed these changes for eight land cover classes in the south of Benin by using an integrated multi-temporal analysis using three Landsat images (1972 Landsat MSS, 1986 Landsat TM and 2005 Landsat ETM+). Three scenarios for the future were simulated using a first-order Markovian model based on annual probability matrices; the contribution of tree plantations to compensate forest loss was also assessed. The results show a strong loss of forest and savannas, mainly due to increased agricultural land. Natural woody vegetation ("forest", "wooded savanna" and "tree and shrub savanna") will seriously decrease by 2025 due to the expansion of agricultural activities and the increase of settlements. Tree plantations are expected to double by 2025, but they will not compensate for the loss of natural woody vegetation cover. Consequently, we will assist to a still continuing woody vegetation area decrease. Sustained policies regarding reforestation and forest conservation must be initiated to reverse the currently projected tendencies.
Keywords: landscape, land use and land cover changes, probability matrices, first-order Markovian model, tree plantations, Benin.

52. Influence de la lisière sur la productivité du teck (Tectona grandis L.f.) : étude de cas des teckeraies privées du Sud-Bénin.

Toyi Sêwanoudé Scholastique Mireille, Bastin Jean-François, Andre Marie, De Cannière Charles, Sinsin Brice & Bogaert Jan.
Tropicultura **(in press).**

Résumé

La présente étude vise à améliorer la production du bois de teck (*Tectona grandis* L.f.) à l'échelle des plantations privées du Sud-Bénin à travers l'application d'un concept central de l'écologie du paysage : l'effet de lisière. Le teck étant une espèce héliophile, l'hypothèse d'une plus forte production de bois en lisière a été testée. Ainsi, 62 teckeraies privées ont été parcourues et 10667 arbres ont été mesurés. L'échantillonnage stratifié en 3 zones distinctes pour chaque plantation : le centre, la lisière et les sommets (coins des plantations), a permis de mettre en évidence l'effet de lisière sur la production de bois. Dans chaque zone, une placette a été installée et le diamètre à 130 cm du sol (dbh) a été mesuré pour tous les arbres. La différence de surface foliaire par individu entre la lisière et le centre des plantations a également été mesurée. Enfin, l'influence de la configuration spatiale des plantations et de l'orientation de chaque coté des plantations sur la production de bois a été testée.

Les résultats montrent que l'effet de lisière sur la production du bois de teck touche 4 lignes de plantations, la première présentant une production de l'ordre de 150% par rapport au centre. On note également une influence significative de la lisière sur la surface foliaire, (production de l'ordre de 218% en lisière par rapport au centre). Aucune influence de l'orientation des côtés de la plantation n'a été observée. La forme des plantations présente une influence significative sur la production de bois. Ainsi, les plantations ayant une forme maximisant leur périmètre par rapport à leur surface, présentent une production de bois plus importante.

Ces résultats ont permis de proposer un modèle de plantation inclus dans un système agroforestier qui optimise la production de bois par unité de surface et présentant une succession de 2 lignes de plantation entrecoupées de champs.
Mots-clés: production du bois en lisière, Ecologie du paysage,modèle de plantation, Sud-Bénin.

53. Medicinal Plants Used In Some Rural Districts in Senegal (West Africa)

Aba Toumnou Lucie., Seck Dogo, Kindomihou Valentin, Agbangba C. Emile, Sembene Mbacké

***American-Eurasian Journal of Sustainable Agriculture*, 6(4): 325-332, 2012**

Abstract

In Senegal, people often used local plants for healing. Ethno botanical surveys conducted in several rural communities on a sample of 184 farmers were allowed to collect thirty three (33) native plants used to treat intestinal worms, malaria, hypertension, sexually transmitted infections, toothaches, menstrual cramps, hepatitis, cough and scar. The data were analysis by a factor analysis of correspondence. The plants were divided into 18 families (Combretaceae, Annonaceae, Fabaceae, Pedaliaceae, Caesalpiniaceae, Capparaceae, Anacardiaceae, Euphorbiaceae, Poaceae, Labiatae, Meliaceae, Apocynaceae, Acanthaceae, Asteraceae, Celastraceae, Vitaceae, Piperaceae and Mimosaceae). The families of Meliaceae, Combretaceae and Piperaceae were mostly used. The plant parts most commonly used were leaves and bark. The infusion, decoction and maceration methods were the most used preparations process of the drugs. This collection of plants indicated in the treatment of these diseases could be a database for advanced studies (bioassay and phytochemical analysis).

Key words: Senegal, Medicinal plants, ailments

54. Firewood potential production of three sahelian woody species (Grewia bicolor, Pterocarpus lucens and Combretum glutinosum) in Ferlo (Northern Senegal)

Daouda NGOM, Amy BAKHOUM, Valentin KINDOMIHOU, Sékouna DIATTA, Léonard Elie AKPO

***Advances in Environmental Biology*, 6(8): 2329-2334, 2012**

Abstract

This study aim to find the mostly used forest species for firewood, to establish predictive models for the wood potential and evaluates the needs and the potentialities of production of the ligneous in Velingara-Ferlo Rural Community (Senegal) in western Africa. Three mostly preferred firewood species (Combretum glutinosum, Pterocarpus lucens and Grewia bicolor.) were identified using socio-economical investigations. The daily wood consumption was estimated from women, to 1.26 kg wood/anybody/day. Allometric relations were also established between the woody biomass and circumference based on dendrometrical and weighed data matrix built from woody individuals, i.e. C. glutinosum (n = 23), P. lucens (n = 12) and G. b i c o l o r (n = 12). This contributes to assess the woody average production of these species which is estimated to 3.5 tons ha. C. glutinosum shows the largest contribution of this value due to it relatively high density (103 individuals per hectare). The wood quantity currently used a year (7318 tons) meanly account for 2.4% of the forest trees stands (309 474 tons).

Key words: firewood - surveys - production - allometric relations.

55. TEMPORAL CHANGE IN SILICA ACCUMULATION, COVARIATIONS WITH FOLIAR MINERALS AND FODDER VALUE OF LOXODERA LEDERMANNII (PILGER) EX LAUNERT FROM THE SUDANIAN BENIN (WESTERN AFRICA)

Kindomihou M. Valentin, Holou A.Y. Roland, Dagbénonbakin D. Gustave, Sinsin Brice, Meerts Pierre

***International Journal Of Academic Research* Part A 4(3), 144-152. DOI: 10.7813/2075-4124.2012**

Abstract

Silica in forage grasses has been found to be an important factor in reducing cell-wall constituents' digestibility. As the more the silica concentration, the less the grasses digestibility, techniques for silica reduction in grasses are needed. The silica rate reduction might induce other important nutrients 'reduction. This study examines temporal change in Loxodera ledermannii (Pilger) chemical composition and silica concentration in leaves from individuals collected at 15-days intervals from April to October in W National Park. Some 100 g of fresh leaves from 90 clumps were oven dried and analyzed for silica, Ashes, N, Na, Ca, P, K, Mg. Digestible Nitrogen Matter and Fodder Energetic value were calculated using Demarquilly formula. SiO2 negatively related to K, P, N and UF, but positively to MAD, Ashes and Ca. This suggests that SiO2 concentration could be reduced without affecting significantly the concentration of the important nutrients such as Ashes and MAD.

Key index: Loxodera ledermannii, silicification, chemical traits, fodder value, sudanian Benin

56. The effect of seasonal variation on foliar silicification, covariations with minerals and forage value of Itchgrass [Rottboellia cochinchinensis (Lour.) W.D. Clayton]' from sudanian Benin

Kindomihou Missiako Valentin, Adjolohoun Sebastien, Holou Yaovi Ahouelete Roland, Sinsin Augustin Brice and Meerts Jacques Pierre

Journal of Life Sciences **(In press).**

Abstract

Silica (SiO2) in forage grasses has been found in reducing cell-wall digestibility. This study investigates whether: (i) the seasonal variability affects the silica and minerals accumulation and forage values of leaves of R. cochinchinensis and (ii) silica concentration is correlated with minerals and fodder value. In an Itchgrass population selected in the W Biosphere Reserve, leaves were collected on 90 marked plants from May to October 2003 and 2004, at 15 days intervals except May, June and October. Some 300 g of fresh blades from the 3rd most recently expanded leaves were oven dried and analyzed for dry mass, SiO2, ash, N, Na, Ca, P, K, Mg. Digestible Nitrogen Matter (DNM) and Fodder Energetic Value (FEV) were calculated using Demarquilly formula. Data except SiO2, Ash and nutritional traits were log-transformed to restore homoscedasticity before Statistical analyses. SiO2 ranges from 5.69% to 9.95%, i.e. varying 1.4 fold between May and October, reaching 1.75 fold at mid-September. SiO2 positively related to Ca but negatively to K, P, N, DNM and FEV. The negative correlations suggest that SiO2 concentration in R. cochinchinensis could be reduced with a significant increase in energy and accumulation of important nutrients such as N, P and K. Therefore, leaf silicification and nutritive value relationship should be conclusive in the case of Itchgrass.

Key index: Rottboellia cochinchinensis, Silicification, Minerals, Seasonal variations, Forage Value, Covariations, Sudanian Benin

57. Environmentally induced variation in germination percentage and energy of naked caryopses of Loxodera ledermannii (Pilger) W.D. Clayton ex Launert in subhumid Benin (West Africa)

KINDOMIHOU Missiako Valentin, GLELE KAKAI Romain Lucas, ASSOGBADJO Achille Ephrem, HOLOU Roland Ahouelete Yaovi, SINSIN Brice Augustin

Advances in Environmental Biology (under review)

Abstract

This study investigated the conditions for maximizing germination of Loxodera ledermannii, an earlier and nutritional tropical fodder grass species. We examined the correlation of percentage germination with seed container, substrate, sowing depth, methods and date of sowing. Naked caryopses of L. ledermannii were subjected to various growth conditions. Results showed that percentage germination depended on growth conditions ($P = 0.001$) and energy of germination ($P = 0.0001$). Effects of the seed container, substrate, sowing depth, methods and sowing period were significant ($P < 0.05$). Refining of the substrate improved the percentage germination. Seed container coverage and sowing depth substrates increased the energy of germination ($P = 0.000$); their magnitudes were dependent on substrate types, being average for sterilized soil (56%) and higher with blotting paper (84.9%) and refined soil (121%). Highest germination energy was recorded for covered and deeper seed containers (< 5 days). Tamping increases notably the caryopses germination and the plant density through the growth period. Further studies are needed to well characterize constitutive variation of these traits.

Keywords: Germination percentage, energy, caryopses, Loxodera ledermannii, growth conditions.

58. Ecological differences within African Bush Mango trees in tropical Africa with emphasis on the Dahomey Gap (West Africa)

Romaric Vihotogbé, Niels Raes, Ronald G. van den Berg, Frans Bongers, Brice Sinsin & Marc S.M. Sosef

Tropical Plant Biology **(under review)**

Abstract

Bush mangoes (Irvingiaceae) are priority food trees in humid areas of West and Central Africa. There are bitter and sweet fruited trees which are difficult to distinguish based on morphological characters. This has led to a taxonomic debate, hindered by the lack of quantitative comparative data. Furthermore, their occurrence in the Dahomey Gap, the dry savannah corridor between the two West African forest blocks, is unexplained. This study evaluates the ecological differences between bitter and sweet trees in tropical Africa and studies the possibility that the Dahomey Gap is part of the natural distribution range of bush mango trees. Occurrence data from the Dahomey Gap and elsewhere (in tropical Africa), were combined with

climatic and soil data in Maxent to produce ecological niche models for bitter and sweet trees. Ecological niche identity tests were carried out in ENM-Tools. Wild sweet trees were predicted in the Guinean-Congolian phytogeographical region, while the predicted occurrence of bitter trees extended to the Guineo-Congolia/Sudania and Lake Victoria regions. This difference is significant, supporting the idea that bitter and sweet trees belong to two different species. We also conclude that bitter trees occur naturally only in a small part of the Dahomey Gap, the Volta forest region. Lastly, our results suggest that the natural distribution of sweet trees excludes the Dahomey Gap, where they occur only in cultivation. The history of their occurrence in this eco-region remains unclear.

Key-words: Benin, Climate, Ecological Niche Modeling, Irvingia, Maxent, Togo

59. Backgrounds of the domestication process of African bush mango trees (Irvingiaceae) in the Dahomey Gap (West Africa)

Romaric Vihotogbé, Romain Glèlè Kakaï, Frans Bongers, Tinde van Andel, Ronald G. van den Berg, Brice Sinsin, Marc S.M. Sosef

Plant Ecology and Evolution **(under review)**

Abstract

Bitter and sweet African bush mango trees (ABMTs) belong to the family Irvingiaceae and are valuable non-timber forest products in sub-Saharan Africa. They have not been studied well in the western part of their distribution range, and many aspects of their large-scale development remain unknown. In this study, we link the agroforestry status of ABMTs to differences in socio-cultural groups in order to identify the key factors influencing their abundance and survival in the Dahomey Gap.

First, we gathered the uses and local management strategies from the nine main socio-cultural areas in Benin and Togo. Second, occurrence data were obtained throughout the Dahomey Gap and imported into DIVA-GIS and MATLAB to calculate the spatial density pattern and analyse its structure. The variation of this pattern was analysed relative to three factors: the country, the phytogeographical zone and the dominant FAO soil category. Third, agroforestry system characteristics and farmers' social status relative to 841 trees were used in a multinomial logistic regression to identify anthropogenic factors driving the intensive cultivation of ABMTs. Finally, the impact of socio-cultural activities on extent and density of ABMT populations was analysed.

In the entire study zone, the sweet mesocarp is consumed and the valued seed of bush mangoes is commercialized. The application of seed-based diets and socio-therapeutic uses are common to communities in Benin. Sweet ABMTs are generally found either in home gardens or cultivation fields where they may occur at high densities (up to 1020 trees per 25 ha). Bitter trees, however, are confined to the Volta forest region in Togo and occur at low densities (< 462 trees per 25 ha) in the wild, sometimes in protected areas, in forest gardens as well as on fields. This indicates a clear difference in cultivation methods between bitter and sweet trees. Farmland status, farmer socio-cultural group and type of ABMTs determined the cultivation intensity. The fact that small farmlands are converted into sweet ABMT orchards indicates that farmers actively cultivate ABMTs in the Dahomey Gap. Diversity of indigenous knowledge, however, is not correlated to intensive cultivation nor to domestication efforts or local genetic conservation programs. Where slash and burn agriculture and intensive collection of fruits jeopardize bitter trees, traditional fishing systems (using twigs), a traditional selection strategy, and intensive land commercialization severely threaten sweet ABMT genetic resources.

Key words: Benin, conservation, ethnobotany, Irvingia, kriging, spatial distribution, Togo

60. Does phenology distinguish bitter and sweet African Bush Mango trees (Irvingia: Irvingiaceae)?

Romaric Vihotogbé, Ronald G. van den Berg, Frans Bongers, Brice Sinsin, Marc S.M. Sosef

Abstract

African Bush Mango trees are priority food trees in Sub-Saharan Africa. The unclear distinction between bitter and sweet fruited trees is still subject to taxonomic debate, which hinders their effective use and conservation. This study investigates differences in phenological behaviour between bitter and sweet fruited populations and their taxonomic implications. Monthly phenological data on seven populations of bitter or sweet bush mangos in Benin and Togo were used to assess within and between mango type phenological diversity, to discriminate bitter and sweet trees and to evaluate their responses to environmental factors. The phenological states differentiating bitter and sweet trees were identified and individual trees were classified based on the discriminating phenological characters. Finally, phenological variation was analyzed with time of the year, FAO soil type, type of bush mango tree, and climatic zone. Phenological diversity varies significantly among populations. Bitter and sweet trees have consistently different phenological states. Bitter trees have a lower phenological diversity for all phenological phases throughout the year compared to sweet trees, possibly due to their limited distribution range in the study area. The tree types also differ in their reproductive responses to most investigated environmental factors,

but did not respond differently to soils. These results support the hypothesis that bitter and sweet trees represent different species.

Keywords: adaptation, ecology, domestication, Irvingia, phenological states, species distinction.

61. Morphological Characterization of African Bush Mango Trees (Irvingia species) in the Dahomey Gap (West Africa)

Romaric Vihotogbé, Ronald G. van den Berg, Marc S.M. Sosef

***Genetic Resources and Crop Evolution* (under review)**

Abstract

This study investigates the morphological characteristics of bitter and sweet African bush mango trees (Irvingia species). African bush mangoes have been rated as the highest priority multi-purpose trees in need of improvement research in West and Central Africa. This study was carried out in the Dahomey Gap which is the West African savannah woodland area separating the Upper and the Lower Guinean rain forest blocks. We studied 128 trees from six populations and characterized their bark, fruits, mesocarp and seeds to assess the morphological differences among populations in the field. First, characteristics that might allow the distinction of bitter and sweet trees were analysed in a binary logistic regression. Second, a Principal Component Analysis was performed on fruit, mesocarp and seed measurements to define groups. The significance of factors that defined these groups was assessed in a Multivariate Analysis of Variance and a pairwise comparison of populations was performed using the Scheffe test. Lastly, characteristics were used in a cluster analysis (UPGMA). None of the variables: type of bark, mature fruit exocarp colour, fruit roughness and fresh mesocarp colour, were able to consistently distinguish bitter from sweet trees in the field. The analysis of the measurements of fruits, seeds and mesocarps demonstrated that bitter fruits have the heaviest seeds and this consistently distinguishes them from sweet fruits. However, the measurements of the fruit, mesocarp and seed did not have a joint effect in grouping sweet fruited populations. This indicates high diversity and potential for selection across all phytogeographical regions. The sweet trees of Couffo and those of Dassa are clearly different from all other populations. This can be attributed to traditional domestication and climate, respectively. The large fruits and the heavy seeds of the cultivated populations are evidence of successful on-going domestication and selection of sweet trees in the Dahomey Gap.

Key words: Dahomey Gap, domestication, Irvingiaceae, tree-to-tree variation, selection, species concept.

62. Genetic diversity and difference within and between bitter and sweet African bush mango trees (Irvingia spp., Irvingiaceae) in West and Central Africa

Vihotogbé R, van den Berg RG, Missinhoun AA, Sinsin B, Sosef MSM

***African Journal of Biotechnology* (under review)**

Abstract

The domestication of the economically most important food tree species used in sub-Sahara African communities should be improved to enhance their production within agroforestry systems and combat the food deficit crisis in this region. African bush mango trees (Irvingia species) are top priority among the species that are preserved and integrated in agroforestry systems in the humid regions of tropical Africa. The taxonomic debate related to the species or varietal status of the bitter and sweet fruited African bush mango trees hinders their domestication process and rational use. AFLPs and cpSSRs were used in this study to assess the genetic diversity of African bush mango trees and to test the distinction between bitter and sweet fruited trees across Togo, Benin, Nigeria and Cameroon. Low genetic diversity was found fort he isolated population of bitter trees occurring in south-western Togo due to the higher fragmentation of the small sized forest ecosystem in which they occur and the continuous reduction of the population size. The higher polymorphism and genetic diversity of the sweet tree populations in Benin and Togo indicate the effect of domestication of material with different geographical origin due to frequent long distance transfer of genetic material. When used separately, the AFLPs and cpSSRs failed to consistently discriminate populations and tree type. But the combined dataset from both markers generally differentiates geographically recognizable groups, and bitter from sweet trees. The suitability of AFLPs and cpSSRs to test our hypotheses within Irvingia is discussed.

Key words: AFLP, cpSSR, Benin, Togo, Dahomey Gap, Irvingia, taxonomy, domestication.

63. Germination of seeds from earlier fruits of African bush mango in the Dahomey Gap (West Africa)

Romaric Vihotogbé, Laurent G. Houessou, Achille Ephrem Assogbadjo, Brice Sinsin

International Journal of Biological and Chemical Sciences (under review)

Abstract

In order to help small scale farmers establish uniform plantations of bitter and sweet African bush mango trees (ABMTs: Irvingia spp.; Irvingiaceae) in the Dahomey Gap, germinability of earlier seeds was experimented in completely randomized design in close and sun-shining conditions. Variation of seed germination speed and seed germination rate were analyzed against the type of ABMTs, the provenance, the drying level as conservation strategy used by farmers and the germination condition. Principal Component Analysis (PCA) was carried out with seed germination speeds at different germination rates in order to determine the groups of seeds that help overcome the climatic hindrances for ABMTs plantations establishment in the Dahomey Gap. Only the drying level significantly influenced the percentage of germination. Fresh seeds (regardless the type of ABMTs, provenances and germination condition) showed the highest performance (98 – 100 %) and this steadily decreased when increasing the drying level until 3 weeks (5 – 11 %). Moreover, the seed germination speed significantly depended on the drying level and on the germination condition. Thus, seeds germination speeds were higher for fresh seeds and in the close condition, confirming bush mango seeds as typical recalcitrant but none strictly photoblastic. Finally our results highlighted that fresh seeds (bitter and sweet regardless the provenance and the germination condition) as the one that quickly germinated, and thus being the best material to be used for establishing earlier and viable seedling and uniform plantations of ABMTs on their potential cultivatable farmland in the Dahomey Gap.

Key words: Agroforestry systems; Benin; Irvingia spp.; Propagation techniques; Togo.

64. How institutions shape human-crocodile interactions: a framing analysis in support of agro-pastoral dam management in Benin

G.N. Kpéraabcd1, R.C. Tossou e, N. Aartsf, G.A. Mensahg, D.K. Kossouh, A.B. Sinsini and A.J. van der Zijppj

International Journal of Agricultural Sustainability **(IJAS) (under review)**

Abstract

Being a protected species, crocodiles make themselves at home in agro-pastoral dams where they share ecosystem services with the local communities. Our rationale is to sharpen our understanding of three questions: how do stakeholders frame the presence of crocodiles, how do stakeholders frame formal and informal institutions that shape their behaviours vis-à-vis crocodiles, and what contexts have stakeholders collectively constructed that help them justify their opinions and their behaviours in their relationships with crocodiles. Using a comparative case study design in three villages in northern Benin, an interactional framing perspective was adopted. Stakeholders in the villages of Nikki and Sakabansi expressed their discontent because their activities were hampered by crocodiles. Stakeholders in the village of Fombawi, although experiencing the same damages, co-constructed informal rules that help them to live with crocodiles. These informal rules were based on the cultural belief that crocodiles are holy and thus should be respected and protected. In Nikki and Sakabansi, formal rules that aimed to protect crocodiles were framed as not sufficiently taking into account human livelihoods. Informal rules for dealing with crocodiles, therefore, have emerged ignoring the formal rules. The paper suggests different ways for creating space for institutional changes and sustainable management of agro-pastoral dams that would allow crocodiles and local communities to peacefully live together.

Keywords: multi-stakeholder, water resources management, formal and informal rules, competing claims on natural resources

65. Crocodile habitat use: living with crocodiles for good management of agro-pastoral dams in Benin

Kpéra G.N.abcd, Mensah G.A.e, Aarts N.f, Tossou C.R.g, Sinsin A.B.h & van der Zijpp A.

Ecology and society**(under review)**

Abstract

In the efforts to optimize the management of agro-pastoral dams in Benin, crocodiles make themselves at home in these dams where they share space and resources (ecosystem services) with local communities, jeopardizing their livelihoods. This study aims at (i) characterising agro-pastoral dams water quality (physical, chemical and microbiological composition), (ii) characterising the distribution of crocodiles' holes and nests as well as village places visited by crocodiles, and (iii) identifying local ecological knowledge of crocodile habitat selection and how this knowledge matches scientific knowledge. The overarching research design was based on case study approach and the use of three main concepts: habitat, habitat quality, and habitat selection. Water samples of Nikki, Sakabansi and Fombawi agro-pastoral dams were collected during different seasons and analyzed in the laboratory. One-way ANOVA test was used to compare physico-chemical water factors of the three dams and two-way ANOVA to evaluate the effect of the interaction between the agro-pastoral dams and the seasons. Besides, 360 people were interviewed and places visited by crocodiles were mapped using ARCGIS 10.1. A G-test was performed to check how local ecological knowledge matches scientific knowledge on crocodile habitat use. Findings showed that dams water quality was problematic for humans, livestock and crocodiles because the levels of physico-chemical factors exceed the standard for human and livestock uses ($p < 0.05$). In addition, dams were polluted by armful bacteria (Coliforms, feacal streptocoque, Escherichia coli, spore of Clostridium, Salmonella typhi, Salmonella typhimurium, Salmonella enteritidis, and Campylobacter jejuni). Places visited by crocodiles included riparian forest, yam farms and vegetable plots, household heap, human habitation, school, and church. Local communities have substantial ecological

knowledge of the way crocodiles use the dam. The study suggests that researchers from both biological and social sciences should develop collaborative efforts and use direct observations, measurements, and communication tools for assessing human-crocodile coexistence and evaluating sustainable dams ecosystem management.

Key Words: Multiple resource use, Habitat selection, Crocodiles, Water pollution, Local ecological knowledge, Water resources management.

66. Management of agro-pastoral dams in Benin: Stakeholders, institutions and rehabilitation research

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NJAS - Wageningen Journal of Life Sciences 60– 63 (2012) 79– 90

abstract

Agro-pastoral dams are waterholes constructed to provide water for livestock and for agricultural development. In Benin, agro-pastoral dams are managed by dam management committees. This study seeks to (1) characterize the stakeholders involved in agro-pastoral dam use and management, (2) identify important institutional and technical impediments and opportunities related to dams as perceived by the stakeholders, and (3) identify a coherent set of domains for research in support of improved dam management and ecosystem rehabilitation. The study was carried out in the Nikki District in northern Benin. The data were collected through focus group discussions, semi-structured interviews, participant observations and participatory exercises with diverse stakeholders. The results show that the dams are sed for multiple purposes such as providing drinking water for livestock and people, fish production, vegetable production, swimming, bathing, washing, house construction, food crop production and cotton farming. All these practices involve diverse stakeholders with different interests, backgrounds, knowledge, and assumptions. In addition, the dams are the main habitat for crocodiles, which thus can also be seen as key stakeholders. The use and management of the dams create conflicts among the stakeholders who all tend to reproduce their own ‘truth’ and to shift the responsibility for solving conflicts to others. Moreover, the water is becoming seriously polluted, which impinges on every stakeholder’s interests. The analysis indicates five domains for further research: (1) the way agro-pastoral dam water quality can be improved, (2) the mechanism through which to improve agro-pastoral dam fish production, (3) the way stakeholders in different contexts do frame crocodile behaviour and habitat use, (4) the characterization of crocodile behaviour and habitat use in agro-pastoral dams, and (5) the way to promote an inclusive agro-pastoral dam management.

Keywords: Multiple resource use Water pollution Complex conflict Crocodiles

Abstracts of presentation during seminar in 2012

(https://www.dropbox.com/sh/8dafi15xct1kpgw/wWmG1hjGl1?m>)

Species habitat suitability modeling: foundations, methods and some examples

Dr. Ir. Gérard GOUWAKINNOU

Abstract

Species distribution models are being increasingly used to model the suitable habitat of plant and animal species and to predict how climate change will impact the habitat of the species. As such, they have become important components of conservation planning and a several modeling techniques have been developed. These models utilize associations between environmental variables and known species' occurrence records to identify environmental conditions which are suitable for the populations and in which they can be maintained. This approach has proven valuable for generating biogeographical information have been applied across a broad range of fields. This presentation will be centered on:

the theoretical framework of the tool,

the types of data that can be used,

some potential sources of species' occurrence records and environmental layers,

the main steps in running and testing a distribution model using Maxent

Some practical examples of application in the available conservation literature.

On the role of mathematical models in ecology and evolution: principles and applications

Dr.Ir.Orou G. Gaoue

Abstract

National Institute for Mathematical and Biological Synthesis, University of Tennessee, Knoxville, TN 37996 USA; and Faculte d'Agronomie, Université de Parakou, Parakou, Benin Sustainable management of resources calls for the intensive and wise use of mathematical modeling as planning and diagnostic tool. This increasing attention to role of mathematical modeling in ecology mirrors the development of modeling in physics where experimental approach and applied mathematical modeling have been critical in the progress of this discipline. The popularity of modeling in ecology is often hampered by the lack of teaching in this field in all levels of higher education. This is even critical in developing countries, that need the most of mathematical modeling tools to predict the state and dynamics of their resources constantly threatened to extinction through deforestation, overexploitation, invasive species. In this talk, I will briefly emphasize the need for systematic inclusion of mathematical modeling in higher education in Africa, and clearly propose modeling techniques that should be taught to encourage the use of predictive ecology. I will outline how to develop, solve and analyze ordinary differential equations (ODEs) and difference equations to address various questions in ecology and applied ecology. I will argue that knowledge of optimal control theory is critical for better understanding and application in evolutionary ecology. Emphasizing life history theory on the selection for traits to maximize fitness, I will present the examples of application of matrix modeling, ODEs and optimal control to address the issue of sustainable harvest of wild plants for non-timber forest products in West Africa.

Pour une meilleure intégration de la dimension socioéconomique dans une étude agro-écologique

Dr. Ir. Emile N. HOUNGBO, Socioéconomiste, Chercheur au LEA, ENSTA-Kétou/UAC

Résumé

Le besoin est de plus en plus ressenti par les chercheurs du Laboratoire d'Ecologie Appliquée (LEA) d'intégrer l'aspect socioéconomique dans les recherches en agronomie et en écologie. L'évidence est désormais établie que la validité pratique et l'utilité des résultats recherchés pour le développement augmentent lorsque cet aspect est pris en compte. La prise en compte de l'aspect socioéconomique augmente ainsi la valeur ajoutée de la recherche effectuée en termes d'applicabilité des résultats obtenus pour le développement; applicabilité traduite notamment par l'adhésion des populations. C'est pourquoi il est de plus en plus fréquent d'observer le vocable «socioéconomique» dans les thèmes de mémoires et de thèses en gestion des ressources naturelles et en agronomie. Mais, on

remarque malheureusement que dans le fond, de plus en plus de ces travaux scientifiques restent déficients en la matière. On a parfois l'impression que les aspects socioéconomiques sont traités en accessoire, sans le respect suffisant des exigences de la recherche en sciences sociales. Ceci se traduit notamment par l'utilisation de concepts et affirmations inadaptés aux exigences de la socio-économie et, in fine, l'échec dans la prise en compte de cette dimension intéressante que l'on entend fournir pour consolider le document. La présente communication sera un espace d'échange pour nous permettre de corriger, ne serait-ce qu'au sein du LEA, ces faiblesses qui affectent nos productions scientifiques. Il s'agira de débattre des points comme :

1) Qu'est-ce que et pourquoi l'aspect socioéconomique dans une recherche en agronomie et en écologie ?

2) Pertinence socioéconomique de la recherche
3) Exigences de la prise en compte de l'aspect socioéconomique
4) Constats et suggestions pratiques.

What is lacking in our science so far?

Dr. Ir. Adandé Belarmain FANDOHAN

Résumé

La présente communication fait une analyse critique des efforts de publications et du niveau des débats scientifiques dans les publications au Benin en matière de questions de recherche, hypothèses et sciences fondamentales en se focalisant sur le cas du Laboratoire d'Ecologie Appliqué. Pour ce faire le communicateur s'est appesanti sur quelques domaines majeures d'expertise au sein du laboratoire incluant la Phytosociologie, l'Ethnobotanique, l'Agroforesterie, la Modélisation des formations forestières, la Conservation, l'Ecologie de l'Evolution et les plantes invasives. La communication s'étend ensuite sur le domaine plus vaste des questions développementales interdisciplinaires auxquelles fait face l'Homo sapiens sapiens et quelques questions encore peu élucidées. L'exposé se termine par un appel à une réorientation des questions de recherche des doctorants Béninois vers des questions pouvant déboucher sur la résolution de questionnements au centre des débats scientifiques internationaux et suivant une approche hypothético-déductive.

Importance des mathématiques appliquées aux vivants en sciences agronomiques

Prof. Dr Ir. Guy Apollinaire MENSAH

Résumé

Les mathématiques constituent une science vivante bien impliquée et utilisée dans les sciences telles que celles du vivant, les sciences de l'information et de la communication, les sciences des matériaux, l'économie et l'écologie etc. La recherche en sciences exactes se divise en recherche fondamentale et en recherche appliquée. La recherche fondamentale permet l'acquisition des connaissances scientifiques alors que celle appliquée en fait un usage pratique et les met au service de la technique. Pendant que les sciences de la vie étudient les organismes vivants et que les sciences de l'ingénieur cherchent à développer l'ensemble des connaissances, des procédés, des techniques et méthodes d'application utilisés par les ingénieurs dans un domaine particulier, les sciences mathématiques étudient les nombres, les fonctions et les figures… Ainsi, les mathématiques appliquées interviennent dans le traitement des problèmes et des données avec le calcul scientifique et numérique. Les sciences agronomiques, englobent la recherche, la production, les organisations internationales, les administrations publiques, le dialogue avec la population, etc. Pour développer des solutions durables en matière d'alimentation, il est indispensable de replacer la production des denrées alimentaires dans son contexte environnemental, économique et sociétal. En ce troisième millénaire, l'agriculture reste un élément central de l'alimentation de la planète. Nombreux sont des défis majeurs à relever du moment où l'époque où les produits de première nécessité étaient à la portée et à la ferme d'à côté est révolue. Les agronomes du Bénin doivent quitter les sentiers battus, explorer de nouveaux domaines et avoir recours à de nouveaux outils d'investigation et de recherche comme les mathématiques appliquées au vivant. Ainsi, le spectre des métiers est extrêmement large car les agronomes très recherchés sont férus de sciences naturelles, exactes, économiques, humaines, sociales, etc. ouverts sur le monde. L'importance des mathématiques appliquées au vivant en sciences agronomiques peut être illustrée par plusieurs cas d'exemples tels que (i) la modélisation et la simulation de la croissance et de l'architecture des plantes, (ii) la modélisation des relations proie-prédateur, (iii) L'établissement des équations simples, multiples et/ou différentielles qui régissent l'utilisation rationnelle des ressources végétales par les animaux domestiques, d'élevage et sauvages, (iv) la détermination de l'âge d'une espèce animale sauvage, (vi) l'estimation de l'indice de consommation alimentaire chez un animal d'élevage… L'importance des mathématiques appliquées au vivant en sciences agronomiques est bien perçue suite au développement de nouveaux systèmes de production agraire à la fois durables et efficaces en Afrique au Sud du Sahara. Certes, cela soulève des questions d'ordre économique, sociétal, éthique et scientifique, qui se posent aussi bien au niveau moléculaire du génotype d'une plante, d'un animal et d'un champignon qu'au niveau du paysage et de la politique agricole mondiale.

Mots clés: Modélisation, simulation, équations, mathématiques appliquées au vivant, sciences

Analysis of extinction risk in eastern and southern African floras

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Abstract

I will be discussing our work on extinction risk in eastern African flora. We analyse the pattern and model the correlates of extinction risk in Eastern Arc Mountain, an important but woefully understudied biodiversity hotspot from a phylogenetic perspective. I will particularly highlight how "Data Deficient" species are traditionally treated in comparative studies of

extinction risk, and finally discuss, using the southern African flora, how such treatment could misguide conservation decisions in the regional context.

Keywords: Comparative analysis; conservation; Eastern Arc biodiversity
hotspot; regional flora; threatened species.

Distribution of tree species along a gallery forest-savanna gradient: patterns, overlaps and ecological thresholds

Msc. Ir. Akomian Fortuné AZIHOU PhD student

Abstract

Savannas intermingled with gallery forests are dynamic habitats typical in Africa. This study aims to determine if differences in species traits lead to non-overlapping distribution of gallery-forest and savanna species and abrupt transition between gallery forest and savanna. Tree species densities were measured in 375 plots of 1500 m2 covering a total sample area of 56.25 ha along forty 3-km transects located at right angles to a riverbed with gallery forest into surrounding savanna. Location, vegetation type, soil physical properties, erosion and fire occurrence were recorded as site factors. Co-occurrence patterns were assessed by computing the frequency of plots where each species pair is jointly recorded. Given that species distribution can have an influence on co-occurrence patterns, a scatter plot of the occurrence of each species according to its mean density was graphed in order to classify species as gregarious, common or rare. Threshold indicator taxa analysis was performed to identify abrupt changes in both the occurrence frequency and relative abundance of tree species along the gallery forest-savanna gradient. Accuracy of the gallery forest-savanna gradient as well as the contribution of soil physical properties, fire and erosion to predict the distribution of tree species at gallery forest-savanna boundaries were assessed by performing fuzzy set ordination. The gallery forest-savanna gradient predicted floristic composition of plots with a correlation of 0.595 but its accuracy was locally modified by the occurrence of fire and the physical properties of soil that covered more than 30% of the range of residuals. The distribution of gallery-forest and savanna tree species did not overlap. Along the gallery forest-savanna gradient, savanna species gradually increased in density while gallery-forest species showed a community threshold at 120 m from the river beyond the width of gallery forest. The forest species driving this trend should play an important role in the dynamics of gallery forest-savanna boundaries.

Key words: Benin, community analysis, ecological thresholds, environmental synthesis, fuzzy set ordination, indicator species, species co-occurrence, vegetation dynamics, woody flora