2010 SCIENTIFIC ACTIVITIES REPORT OF THE LABORATORY OF APPLIED ECOLOGY (LEA)

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Foreword

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

LEA is the leading institution of research on natural resources management in Benin. The major research fields in which LEA is currently involved are (i) climate change, vulnerability assessment, and disaster risk management in the coastal area of Benin, (ii) conservation and management of forest genetic resources, (iii) ethnobotany and new crops development; (iv) management of traditional agroforestry systems and humid zones; (v) ecological restoration of degraded areas (e.g. RAMSAR sites); (vi) ecophysiology of fodder plants; (vii) management of Non Timber Forests Products; (viii) management of protected areas (national parks, hunting zones, community areas); (ix) bio Monitoring of wildlife; (x) red list of threatened plants and wildlife in Benin.

Scientific research at the LEA up to now has yielded in more than 250 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) on sustainable management of natural resources or/and tree domestication in Africa.

The major achievements of the 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; Pentadesma butyraceae ; Caesalpinia bonduc ; Irvingia gabonensis ; 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 in Southern Benin ; 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 Rivers classified forests and 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: *in press*) ; (vii) remote sensing and mapping of vegetation (Swampy Forest of Lokoli, Dense Forest of Lama; Biosphere Reserves of Pendjari and W; etc.).

The LEA works closely with a wide partnership of local and foreign training and research institutions, NGOs, local communities and decision makers at local, regional and continental levels. In fact, The LEA belongs to a wide spectrum of collaboration such as :

- About 10 Professors and 20 Associate Professors from other Departments (Regional Planning, Geography, Chemistry, Soil Science, Botany, Socio-economics, etc..) of the University of Abomey-Calavi ;
- International Scientific Groups such as AETFAT, IUCN (WCPA ; CWRSG) etc.;
- Institutional frame involving in nature conservation and biodiversity management such as World Union for Nature Conservation (IUCN), Bioversity International (ex-IPGRI), World Agroforestry Centre (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.).

The present report is the fourth edition after the one of 2007, 2008 and 2009. It is intended for several audiences of researchers in Benin and abroad, partners, developers, donators and other professionals interested by the fields of applied ecology. It summarizes the research activities which were performed at the laboratory in 2010 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 eleven years (1998 – 2010) and the analysis of language of publications according to the types of publications at the laboratory. Section 3 provides a summary of conferences organized by the LEA in 2009 and those attended by researchers at the LEA. Section 4 describes the research projects and research grants obtained at the laboratory in 2009 whereas section 5 shows details about active human resources at the 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 2009 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, the abstracts of publications in 2010 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 the present report was mainly based on the research activities performed by researchers and students from the laboratory in 2010.

Firstly, information related to the thesis (PhD, MSc, Agronomist degree), scientific articles (published, in press or under review) in peer-review journals and those published through proceedings, books of abstracts and technical reports are described. For each category of publication, the indices of specialization related to the scientific areas in which the works have been performed were assessed accordingly. Also, as far as the published papers in peer-review journals were concerned, two groups of papers have been established: articles with Impact Factor and those without Impact Factor (Web of Science of Thomson). Are considered, only the publications for which address of authors and/or co-authors are the one of LEA or the one related to the Faculty of agronomic sciences, university of Abomey-Calavi. Furthermore, collaborations and co-publications with scientists from developed and African countries have been detailed throughout the report.
The types of research are expressed respectively by 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.

Moreover, the trends of publications from 1998 to 2010 are assessed both for proceedings and published articles in peer review journals (with Impact Factor or not). Also the ratio French/English is computed for various types of publications including the ones in press.

For data processing, the following indices are calculated:

- *Specialization Index of publications* which is the ratio between the number of publications in a given 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 Index of 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.

Moreover, information related to the conferences (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 2010

2.1 Type of research at LEA

In 2010, the published articles are mostly produced in teams at national (53.12 %), regional (6.25 %) and international level (46.63 %). Researchers of LEA used to publish high quality articles (62 %) in the reviews having an IF with international team while about 74 % of the published articles in the review without IF are mostly published in national team (Figure 1).

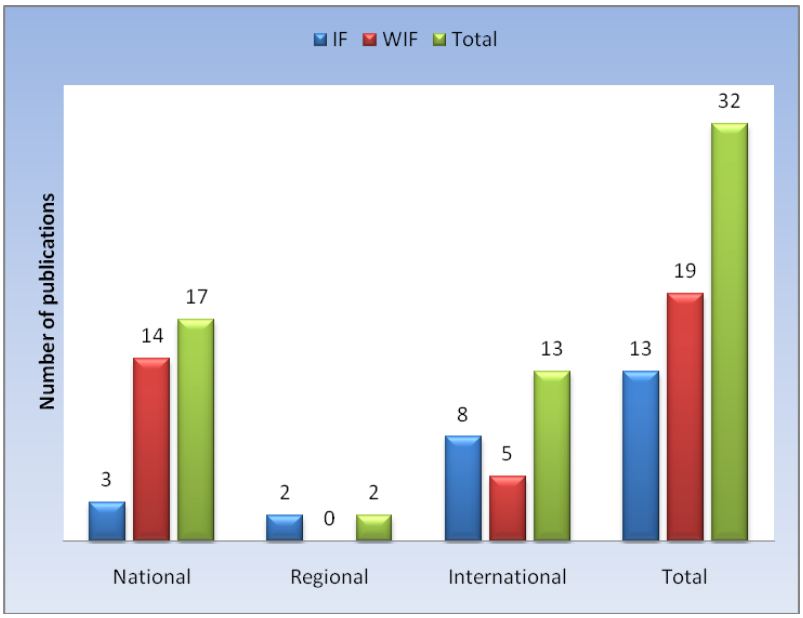

Figure 1: Spatial context of research activities in LEA in the year 2010

2.2 Type of publications at LEA in the year 2009

2.2.1 Theses at LEA

The number of enrolled students in agronomist and MSc degrees has globally decreased from 2007 to 2010 contrary to the number PhD students which have globally increased at the same time (Figure 2). Details about the research topics and candidates are shown in appendices 1, 2 and 3. In 2010, there is no MSc student who defended his MSc thesis in the LEA. At the same time, only two students defended their agronomist degree theses in the LEA. Moreover, despite the high number of PhD students in the LEA in 2010, only one has defended his PhD in 2010.

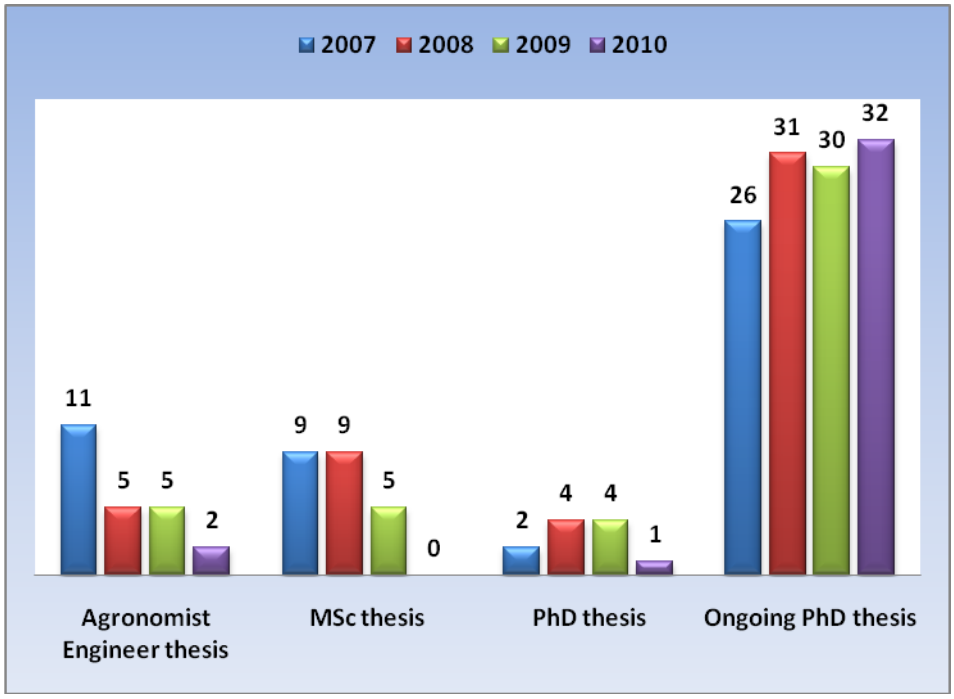

Figure 2: Trends of types of defended and ongoing PhD Theses from 2007 to 2010

2.2.1.1 Ongoing PhD theses at LEA in 2010

In 2010, five main fields of research were covered by the PhD students in the LEA as follow: forest and plant ecology and management (28 %); wildlife and protected areas management (38 %); agroforestry and non timber forest products (28 %), grassland and horticulture (3 %, respectively) (figure 3). From the figure 4, we can say that researchers of LEA have most specialized in the field of wildlife management, agroforestry and forest/plant ecology (Figure 4). This support the fact that LEA use to develop mostly research projects on the above mentioned fields.

Half part of the students enrolled for their PhD has already spent more than 4 years for their research activities (Figure 5). This can be explained by the fact that most of the PhD students in the LEA are workers from public administration and spent maximum half of their time for their research. Consequently their PhD researches take more time than usual (3-4 years).

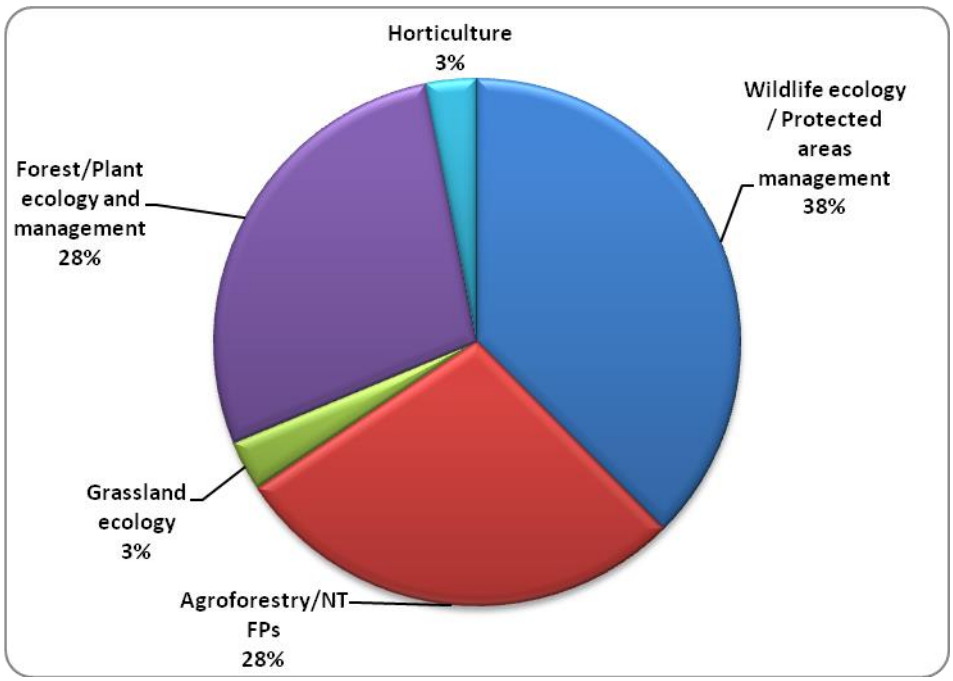

Figure 3: Spectrum of ongoing PhD thesis and related field of research in 2010

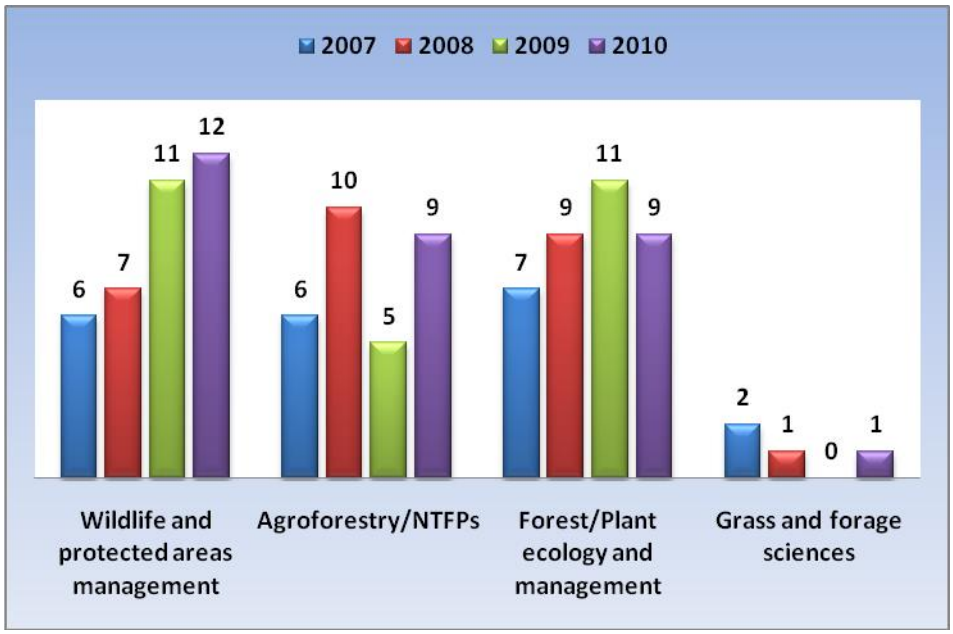

Figure 4 : Trends of ongoing PhD thesis according to the fields of research from 2007 to 2010

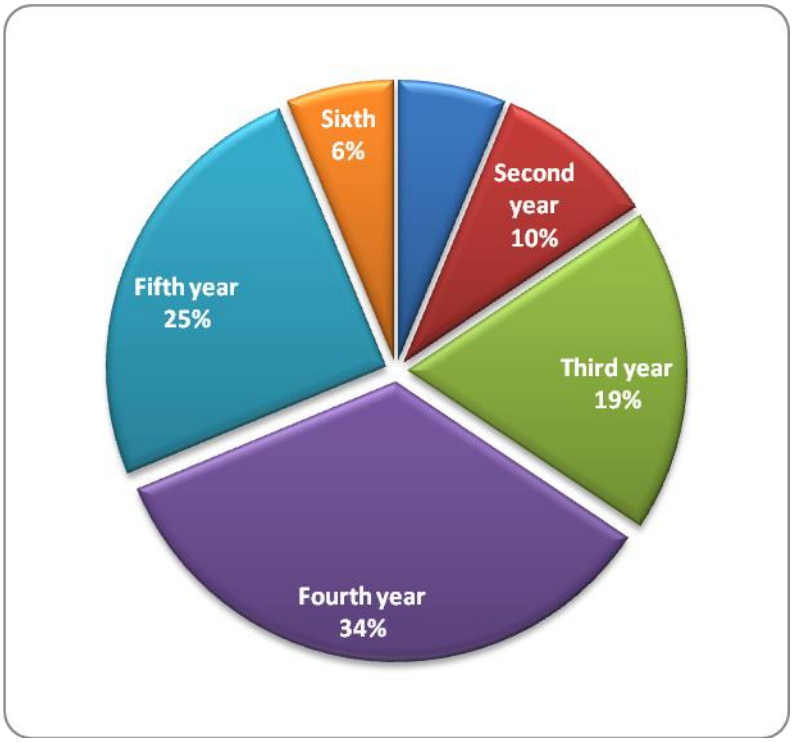

Figure 5: Typology of PhD students in LEA based on the number of year related to their research activities

2.2.1.2. Agronomist degree thesis

Two agronomist degree theses have been defended in the LEA in 2010. Topics are related to agroforestry and ethnobotany.

2.2.2 Scientific productions at LEA in 2010

In 2010, the scientific research at LEA have yielded in 61 scientific publications in peer-reviewed journals: published: 32; in press: 13; under review: 16. Moreover, 3 articles in proceedings, 13 abstracts in the books of abstracts and 3 technical reports have been published in the LEA in 2010.

2.2.2.1 Publications in peer review journals

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

The published articles in 2010 are mostly in the peer review journals without IF (60 %) compared to the number of published papers in the reviews having an Impact Factor (40 %) (Figure 6). However, the number of the published/submitted articles (34) in the journals having Impact Factor in 2010 is higher than the ones without Impact Factor (27) what the case was never in the previous years. The observed trends for the articles under review (Figure 6) will stress this tendency in the following years. As such, we can confirm that more and more researchers of the LEA improve their scientific capacities in publishing their research findings in the peer review journals having an IF. Full references (authors, journals, etc.) of those publications are shown in appendices 4, 5, 6, 7, 8 and 9.

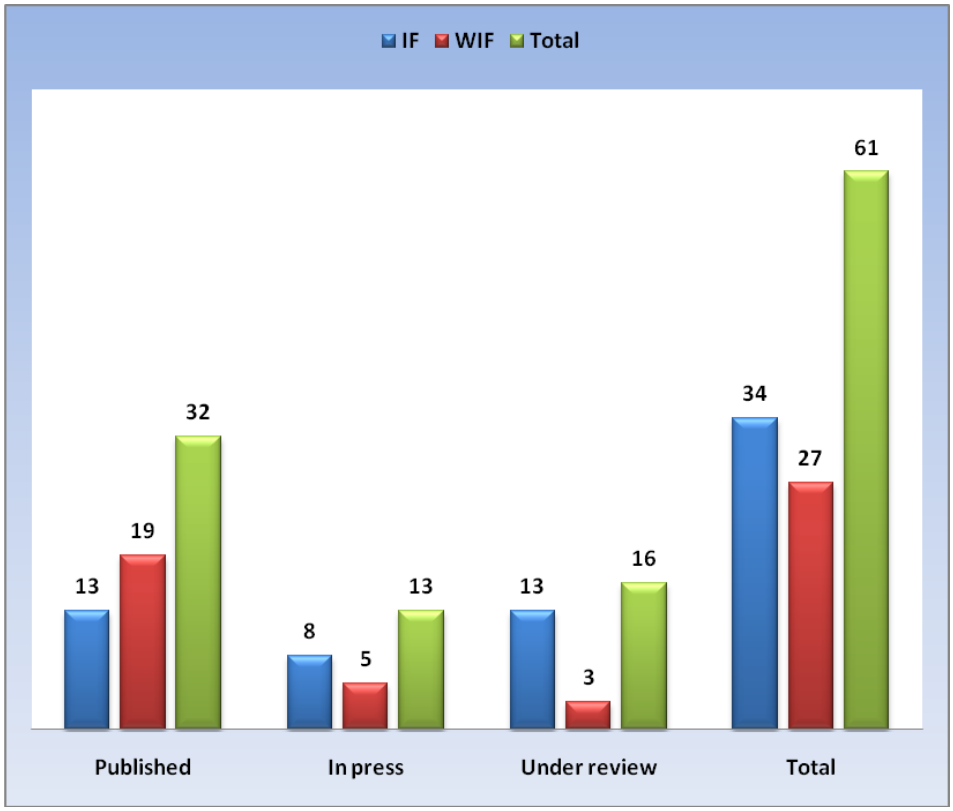

Figure 6 : Spectrum of scientific productions of LEA in 2010

(ii) Specialization Indexes of publications

a) Published articles

In 2010, the published articles cover as the previous years various fields of research such as economic botany (9 %), forest/plant and forest ecology (3 %), ethnobiology (13 %), plants biodiversity (3 %) and molecular biology (3 %). Newly, research topics related to climate change and risk assessment are starting in the LEA (Figure 7) and this will be enhanced in the following years due their importance in the present context of climate change and depletion of natural resources.

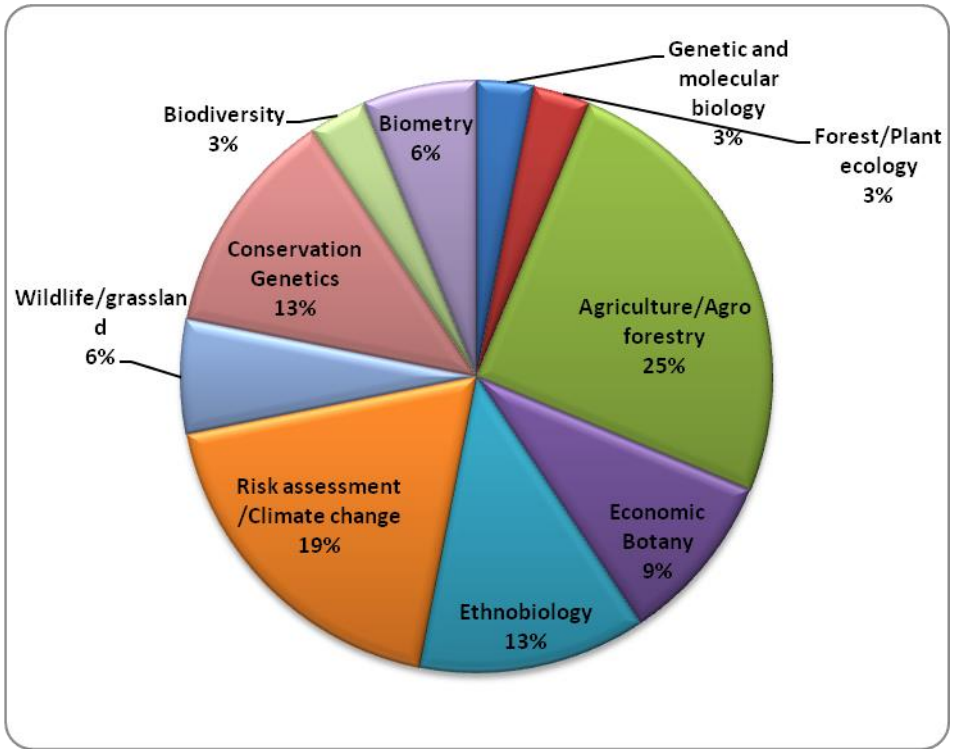

Figure 7 : Published articles according to the fields of research in 2010

b) Articles in press

The articles *in press* also cover various fields such as ethnobiology (31 %), wildlife and forest ecology (15 %, respectively), conservation biology and climate change (8 %, respectively) management of Protected Areas (PA) and socio-economy (8 %, respectively) and, phytogeography (7%) (Figure 8).

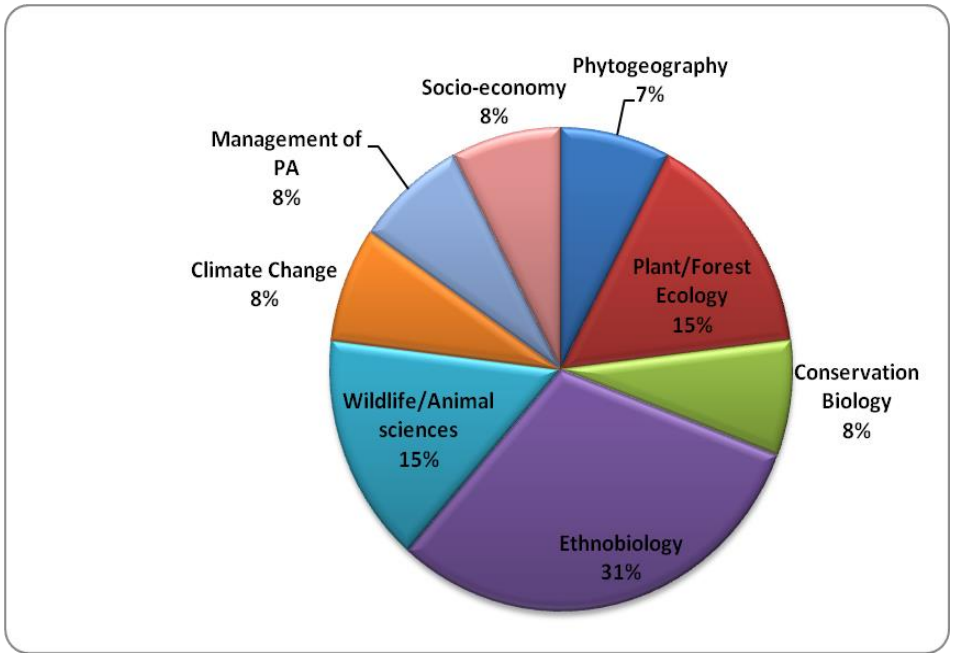

Figure 8 : Articles in press according to the fields of research in 2010

c) Articles under review

The articles still under review also cover almost the same fields of disciplines as above described and indicated on the figure 9. From that, we can conclude that research in the LEA has targeted in 2010 the same fields of research (applied ecology (wildlife and forest), agroforestry, protected areas management and ethnobiology) as it was the case since 2007.

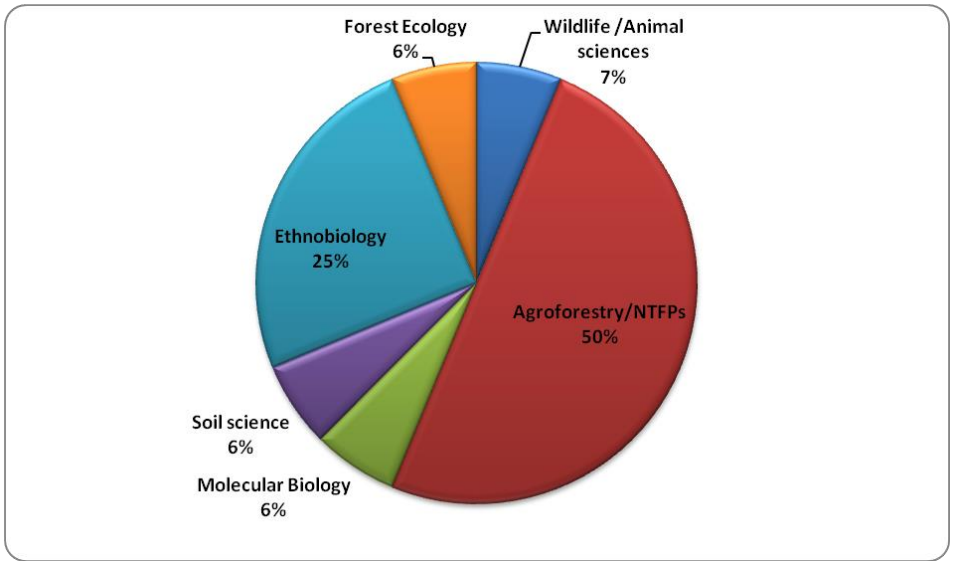

Figure 9: Articles under review according to the fields of research in 2010

(iii) Weighted Impact Factor Index of publications

Publications which have highly contributed to gain the Impact Factor of the laboratory in 2010 were related to plant/forest ecology followed by publications in socio-economy (table 1). Therefore, these fields of publication are the ones in which the recorded scientific publications in LEA had the highest Impact Factor in 2010.

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
Forest Genetics and Forest Tree Breeding	2	1	**0.925** (1.849)
Ethnobiology	3	2	**1.586** (1.5; 0.88)
Plant sciences and Forest ecology	9	4	**2.10** (2.05; 0.62: 1.032; 1.016)
Forest economy	1	1	**1.155** (1.155)
Social science and management	1	1	**0.253** (0.253)
Environmental science	1	1	**0.815** (0.815)
Wildlife ecology	2	1	**0.263** (0.263
Development Economics	1	1	**1.105** (1.105)
Economics of pests and diseases	1	1	**0.09** (0.09)

(): 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

The LEA works closely with a wide partnership of local and foreign training and research institutions at local, regional and continental levels. As it is, its researchers used to publish their research outputs in collaboration with scientists abroad and locally (figure 10). At a country level, most of the publications were written with researchers from Benin (59 %), Germany (22 %), Belgium (13 %), The Netherlands (3 %) and England (3 %).

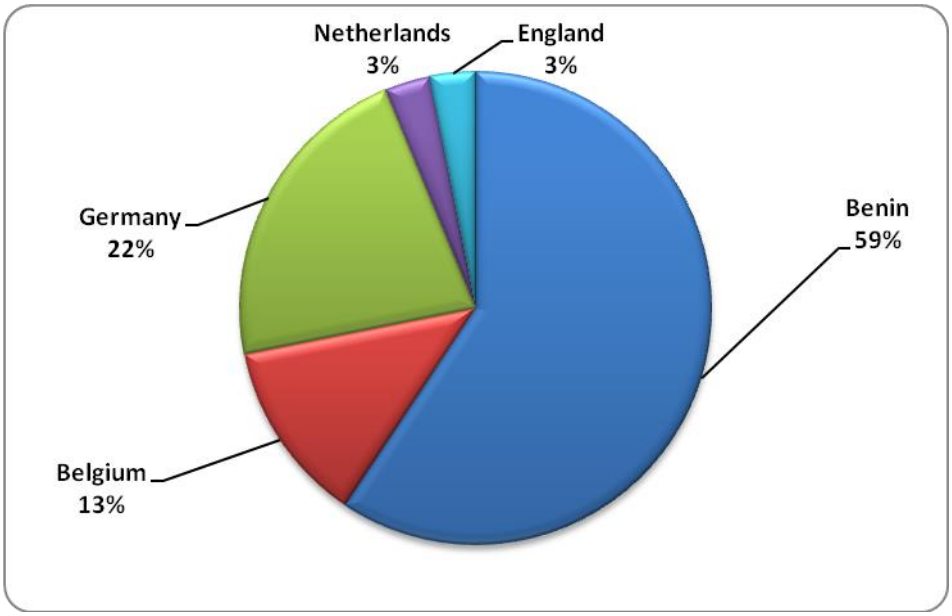

Figure 10: Diversity in indices of the LEA co-publications in peer review journals at countries scale in 2010

b) Continental level

At a continental scale, the most important articles have been co-published in 2010 within Africans (59 %: mainly Beninese) followed by European scientists (41 %) (Figure 11). No publication has been done with scientists from USA as it was the case last year.

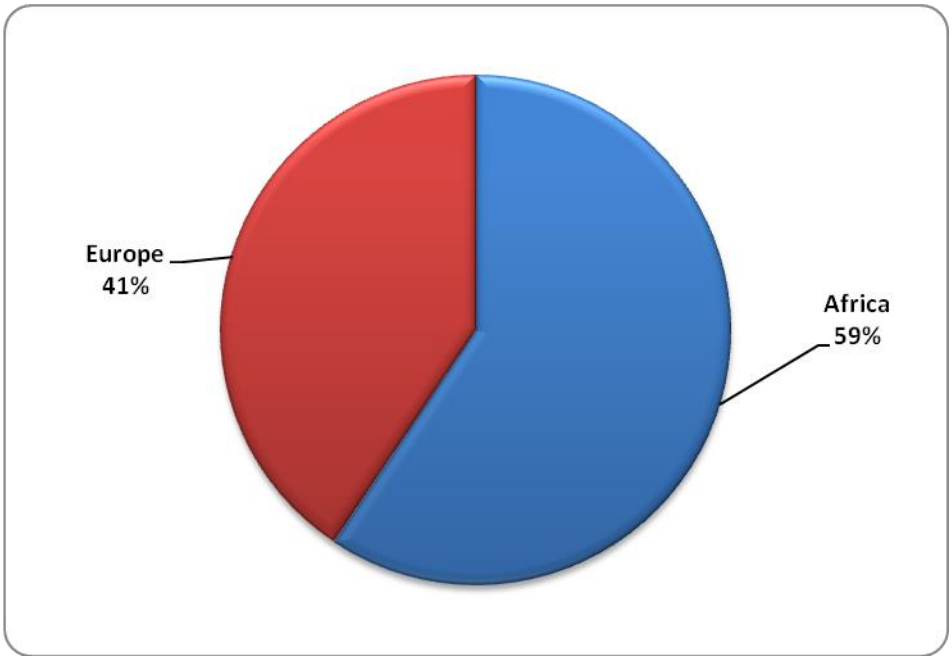

Figure 11 : Diversity in indices of the LEA co-publications in peer review journals at continental level in 2010

2.2.2.2 Proceedings: number of publications and indices of specialization

Contrary to the last year where 14 articles were published in the proceedings of scientific conferences, only 3 articles have been published in 2010 as proceedings. All these publications are related to the conservation of natural resources (see appendix 10).

2.2.2.3 Trends of publications in peer review journals and proceedings from 1998 to 2010

Publications in peer review journals have globally increased from 1998 to 2010 with the highest peak in 2009. Publishing in peer review journals having an 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 having an Impact Factor were generally lower compared to the ones in peer review journals without Impact Factor (figures 12a; 12b). In 2010, the number of published scientific articles is lower (32 in peer reviewed journals) than in 2009 (46 publications in peer reviewed journals) but still higher compared to the previous years before 2009 (Figure 15a).

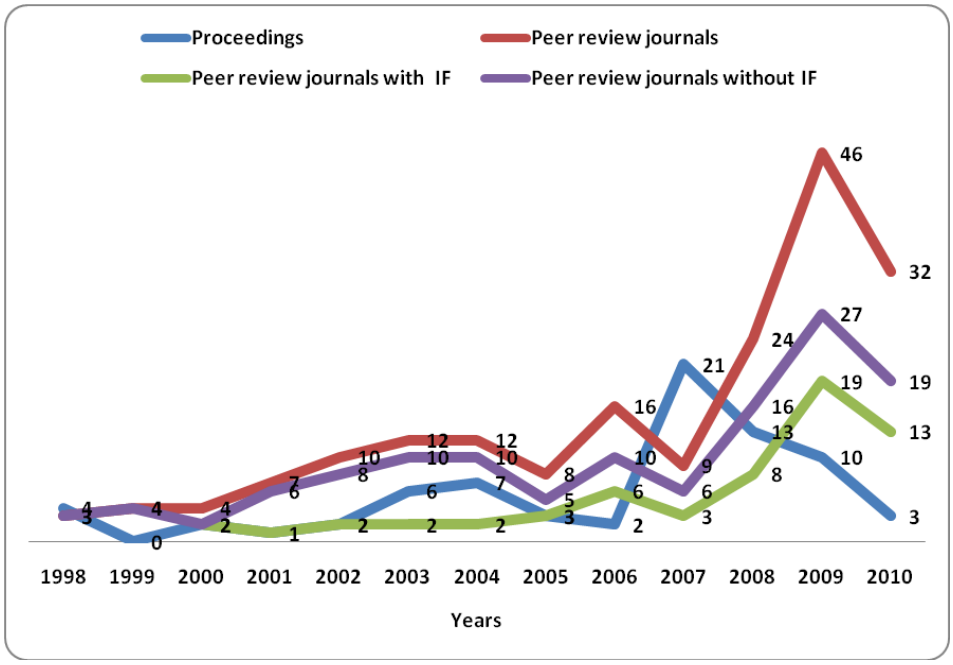

Figure 12 a: Trends per types of publications from 1998 to 2010

2.2.2.4 French/English ratio according to the types of publications

Most of the published articles in peer reviewed journals were published in English in 2010 (Figure 13). All articles published in journals having an IF are written in English meaning that less and less Impact Factor journals accept papers in French. Moreover, theses and proceedings are mainly written in French by the researchers of LEA.

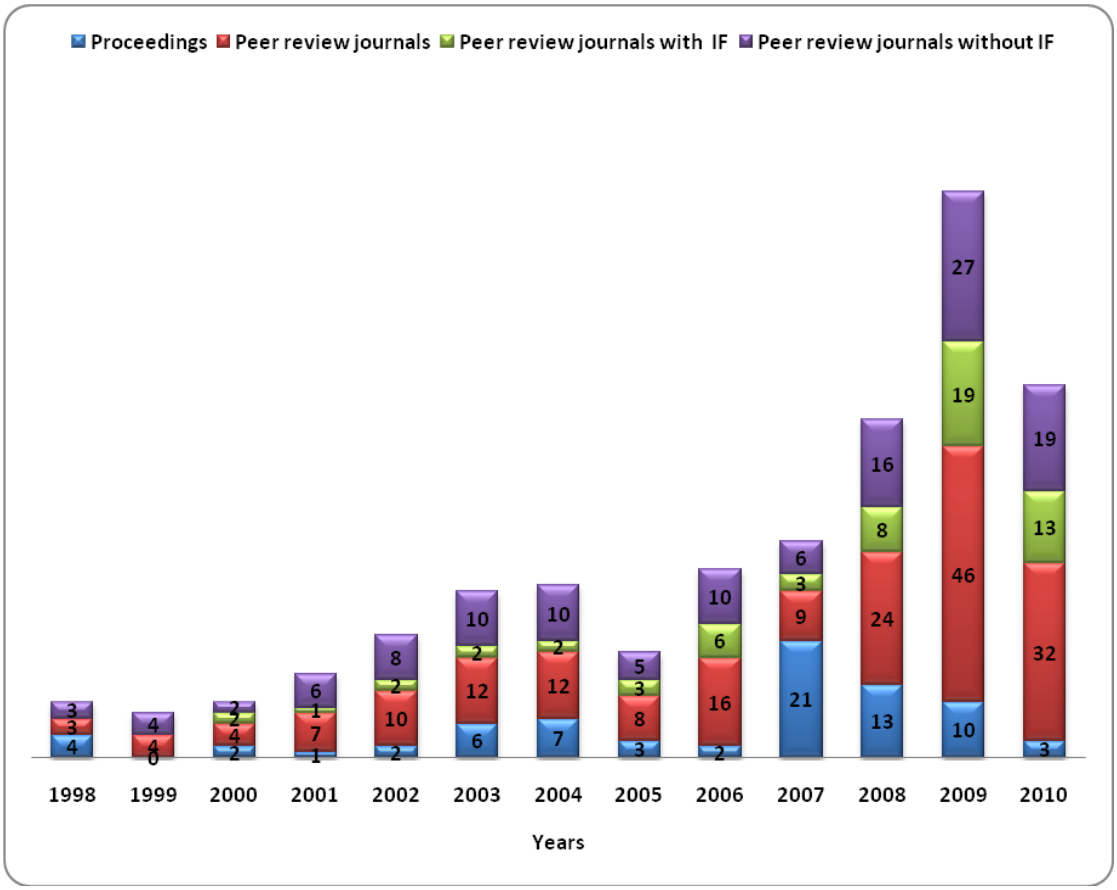

Figure 12b : Spectra of type of publications from 1998 to 2010: percentages of reviews

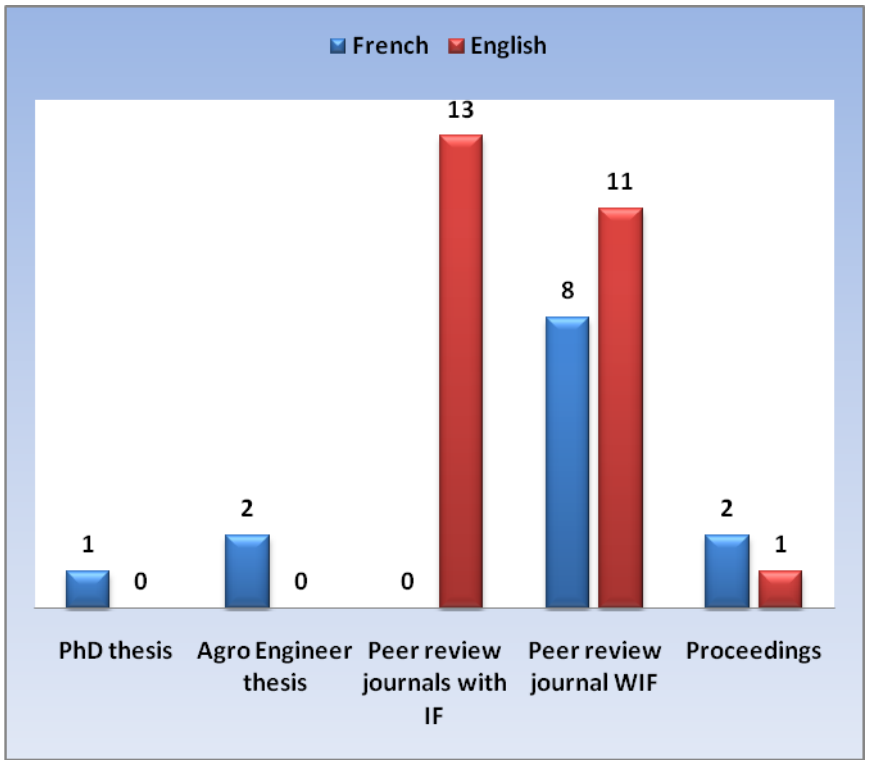

Figure 13 : French/English ratio for various types of publications in LEA in 2010

2.2.2.5: Abstracts: number of publications and indexes of specialization

Thirteen (13) abstracts were published in books of abstracts of scientific conferences in 2010. These abstracts targeted various disciplines as described on the figure 14. Forest/Plant ecology and ethnobiology showed the highest index of publications (38 % and 31%, respectively) followed by wildlife management (23 %) and soil science (8 %). Full references of these publications are shown in appendix 11.

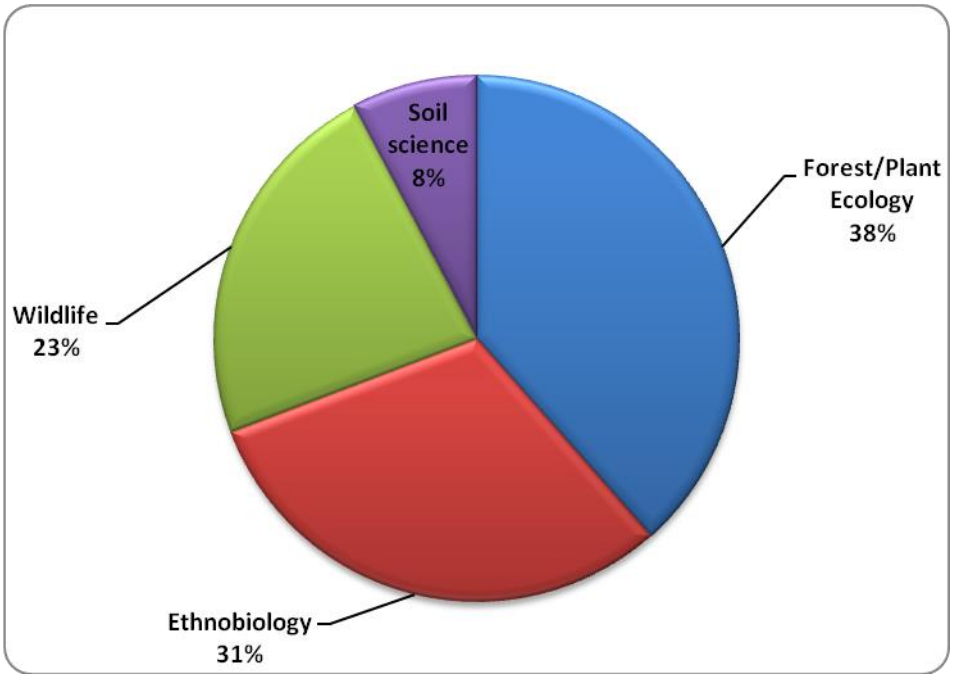

Figure 14 : Indices of publications specialization in the books of abstracts in 2010

3. Conferences and workshops in 2010

In 2010, researchers of the LEA have participated in 28 conferences. 66 % of these conferences were held in Africa (Benin, Togo, Burkina Faso, Mali and Cameroon), 15 % in Europe (Germany), 11 % in Asia (Japan & Korea), 4 % in South America (Venezuela) and 4 % in the USA (Figure 18). Details related to these conferences/workshops were listed in appendix 13.

4. Research projects, research grants and prize at the LEA in 2010

The research activities in the LEA were mainly financed since 2006 by European Union (DADOBAT-UE, SUN-UE, UNDESERT: 28 %), international co-operation projects (BIOTA: 5 %), and international foundations and institutions (small research grants: 67 %) (Figure 16). It is important to notice that most of Projects (DADOBAT, SUN & BIOTA) is ended in 2010. At the same time, the following projects have recently started, i.e. WANOART-EU, LOEWE and PROJECT C2, with the only one WANOART which has no PhD students. Most of the PhD and

MSc students as well as senior scientists in the LEA are involved in these projects for their research activities. Details (objectives, beneficiaries, etc.) on these projects and grants are shown in appendixes 14 and 15. Moreover, two international recognitions have been awarded to the researchers from the LEA in 2010 (appendix 16).

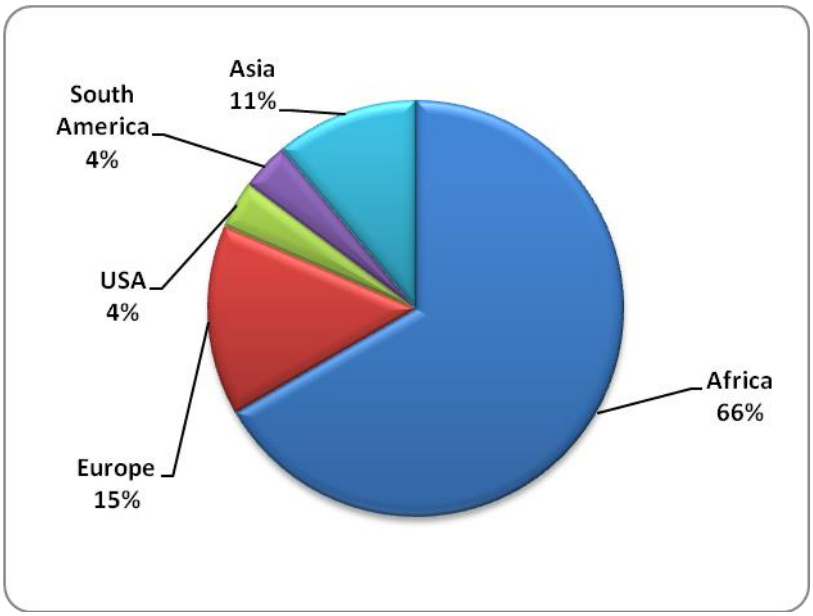

Figure 15 : Level of participation of LEA's researchers to international conferences in 2010

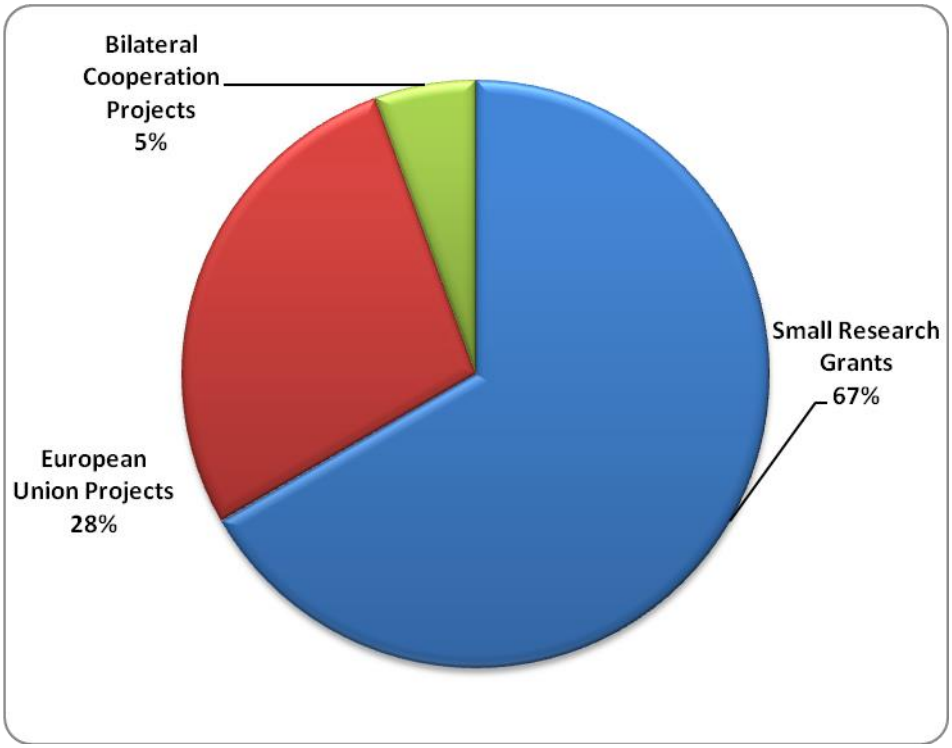

Figure 16 : Spectrum of research funding in 2010

5. Human resources and visiting research in the LEA in 2009

Human resources in the LEA in 2010 are about 20 main investigators and senior scientists, 32 PhD students, 2 agronomist degree students actively participating to research activities within the laboratory. Moreover, 5 technicians and 3 drivers are use on permanent basis for the fieldworks. Specifically, the LEA houses in 2010, one Professor (Professeur Titulaire CAMES), 1 associate Professor (Maitre-Conference/CAMES), 3 senior lecturers (Maître-Assistant/CAMES), 2 Assistants and several junior researchers (PhD, 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 2010, the LEA has welcomed only 3 researchers as visitors against 69 in 2009, 63 in 2008 and 51 in 2007, (Figure 17).

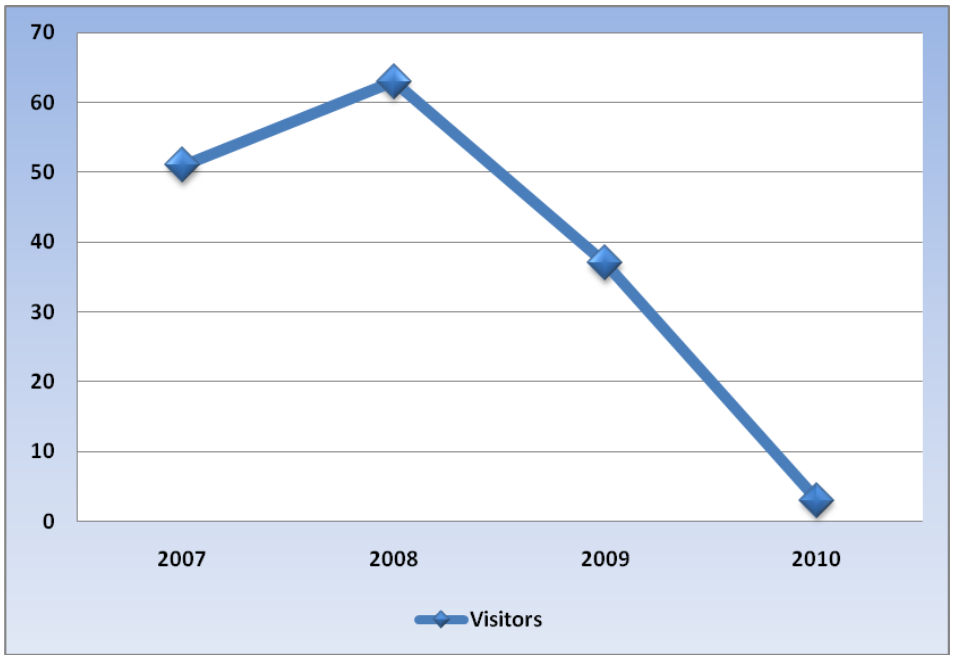

Figure 17 : Trends of visiting researchers welcomed in the LEA from 2007 to 2010

6. General discussion and conclusion

Various types of publications were produced by researchers at the LEA in 2010 as it was the case previous years. It is important to notice that the total number of published papers in peer review journal drop from 46 in 2009 to 32 in 2010. This can be explained by the high number (29) of manuscripts in press and under review which will compensate the gap the following year. However, publications in peer review journals have globally increased from 1998 to 2010 with the highest peak in 2009 (46 articles in peer review journals). The number of published articles in the journals with Impact Factor has considerably increased since 2008 in the LEA. This means that researchers are improving in publishing more and more their outputs in peer review journals. This can be explained at one hand by the increased number of PhD students in the laboratory who should publish their outputs in a peer review journal before defending their thesis according to the regulation of the Faculty of Agronomic Sciences of the University of Abomey Calavi. In other hand, the number of senior scientists in the LEA increases every year. The laters should enrol for the aptitude list of CAMES *(Conseil Africain et Malgache pour l'Enseignement Supérieur*) before getting promotion at a scientific level. This implies they published scientific articles at least in peer review journals. As such, the scientific capacity of the LEA increases more and more as it can be observed throughout the number of publications in peer review journals.

As it was the case in the previous years, the publications in 2010 cover various fields of research. In 2010, the main fields of research covered by the researchers the LEA are forest and plant ecology and management (28 %); wildlife and protected areas management (38 %); agroforestry and non timber forest products (28 %), grassland and horticulture (3 %, respectively). Publications which have highly contributed to gain the Impact Factor of the laboratory in 2010 were related to plant/forest ecology followed by publications in socio-economy (table 1). These disciplines are then the most important in terms of scientific impact of the LEA in 2010 and can be explained by the fact that almost all financial sources in the LEA have focused on these fields of research in 2010. Additionally, most of the ongoing PhD and MSc topics targeted these above mentioned fields of research. The remaining fields of publications (biometry, grassland and pastoralism) had less impact and this can be explained by the fact that they were published in the reviews without Impact Factor or in the one having low Impact Factor. Consequently, it will be important to improve on regular basis strategies for publishing in these fields in leading peer review journals. This objective can be achieved through collaboration with other researchers from outside Africa. In fact, researchers of LEA used to publish high quality articles (62 %) in the reviews having an IF within international team.

To date, almost no scientific works was done with the scientists from Latino America, Asia, 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 further international policies. Moreover, since 2007, very few scientific papers have been published with scientists at a regional level. In 2010, 59% of the articles have been co-published within national team while 41% 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 recommended that the LEA:

(1) help for the capacity building of its researchers in order to be able to publish more scientific paper in leading peer review journals having a high IF;
(2) develop more and more a regional team in order to allow its research activities at sub regional level;
(3) focus its research activities more and more on new and promising field such as molecular biology, risk assessment, climate change and ecophysiology in the current context of global change and conservation of biodiversity;
(4) develop more curricula in the fields of applied ecology for regional training purposes;
(5) continue monitoring biodiversity at continental level;
(6) develop the 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

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- Theses in LEA in 2010 (cf. appendices: PhD, agronomist degree)

- Publications in LEA in 2009-2010 (cf. appendices)

- Proceedings in LEA in 2009-2010 (cf. appendices)

- Guidelines for UAC scientific report (Prof Sinsin Brice/ Vice Chancellor for Research, UAC). 1p.

- Assogbadjo A.E; Kindomihou V., Gbohayida S & Sinsin B. (2008). 2007 scientific report of Laboratory of Applied Ecology. 41 pages. ISBN 987-99919-98-12-4

- Assogbadjo A.E; Kindomihou V., Glele Kakaï R., Gbohayida S & Sinsin B. (2009). 2008 scientific report of Laboratory of Applied Ecology (LEA). 26 pages + appendixes. ISBN 978-99919-305-0-5

- Assogbadjo A.E; Glele Kakaï R., Kindomihou V., Gbohayida S & Sinsin B. (2010). 2009 scientific report of Laboratory of Applied Ecology (LEA). 61 pages.

APPENDIXES

Appendix 1: Ongoing PhD thesis in the LEA

N°	Student full name	Level	Research topics	Fields of Research
1	AVOCEVOU-AYISSO Carolle M.A.*	4th years	Populations' viability of *Pentadesma butyracea* Sabine and their socio-economics in Benin.	*Agroforestry/Non Timber Forest Products*
2	AZIHOU Akomian Fortuné	1st year	Ecology of isolated individuals of gregarious species in the tropics: modelling of plant species distribution and niche colonization based on the concept of dispersal.	*Plant ecology*
3	DELEKE KOKO Kafui Inès Edna	4th year	Ethnobotany and chemical study of galactogenic plants uses in traditional medicine in Pendjari Biosphere Reserve.	*Agroforestry/Non Timber Forest Products*
4	DJAGOUN Chabi Adéyèmi Marc Sylvestre	2nd year	Co-evolution of the feeding and foraging ecology of bovid species in the Pendjari Biosphere Reserve, Northern Benin.	*Wildlife ecology/ Protected areas management*
5	EDON A. T. Solange	3rd year	Baobab regeneration in Benin.	*Plant ecology*
6	FANDOHAN A. Belarmain *	3rd year	Conservation biology of *Tamarindus indica* (Fabaceae) in Benin, West Africa.	*Agroforestry/Non Timber Forest Products*
7	VODOUHE Fifanou G.*	4th year	Non-Timber Forest Products exploitation and Biodiversity Conservation in Benin.	*Environment economy*
8	GOUWAKINNOU Gerard N.	3rd year	Population ecology, productivity and ethnobotany of *Sclerocarya birrea* in Benin.	*Ecology and agroforestry*
9	KOURA Windékpè Tatiana	1st year	"Physicochemical and microbiological parameters change of three type of oil palm waste-manure during composting and their effect comparing to NPK on *Lycoperscicon esculentum* mill and *Capsicum frutenscens* production for market garden".	*Plant ecology /Ecological agriculture*
10	HOUEHANOU Thierry	2nd year	Assessing the effectiveness of protected area in conservation shea tree against mistletoe and tree threatened species (*Afzelia africana, Pterocarpus erinaceus and Khaya senegalensis*) in Pendjari Biosphere Reserve.	*Agroforestry, Forestry, ethnobotany*
11	KPERA Gnanki Nathalie	2nd year	Human and crocodile interaction around agro-pastoral dams in Northern Bénin.	*Wildlife ecology/ Protected areas management*
12	HOUESSOU G. Laurent	4th year	Assessing effectiveness of biodiversity indicators in W Biosphere Reserve and its surrounding area in Benin.	*Wildlife ecology/ Protected areas management*

13	SOGBOHOSSOU Etotépé A.	4th year	Ecology and behaviour of lions (*Panthera leo* Linnaeus 1758) and human-lion conflicts in Pendjari Biosphere Reserve, Northern Benin.	*Wildlife ecology/ Protected areas management*
14	ASSEDE Emeline P.S.	3rd year	Ecologie des communautés végétales de la Réserve de Biosphère de la Pendjari.	*Plant ecology*
15	AVAKOUDJO Julien	4 th	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*
16	AZIZOU EL-HADJ Issa	6th year	Facteurs déterminants de cogestion pour la conservation des ressources naturelles de la réserve de biosphère transfrontalière du W/Bénin.	*Wildlife /protected areas management*
17	NOBIME Georges	5th year	Les facteurs écologiques et éthologiques déterminants pour la conservation du cercopithèque à ventre rouge *Cercopithecus e. erythrogaster* au Bénin.	*Wildlife /protected areas management*
18	MOROU Boubé	6th year	Impacts de l'occupation des sols dans la Réserve sur l'habitat de la girafe et enjeux pour la sauvegarde du dernier troupeau de girafe de l'Afrique de l'Ouest.	*Wildlife /protected areas management*
19	NAGO Sèdjro Gilles Armel	5th year	Savannah amphibians along a disturbance gradient.	*Wildlife /protected areas management*
20	DJEGO - DJOSSOU G. Sylvie	5th year	Aires d'occurrence et comportements socio-écologiques du colobe de Geoffroy (*Colobus vellerosus*) et du colobe de Van Beneden (*Colobus verus*) au Bénin	*Wildlife /protected areas management*
21	TOUDONOU A. S. Christian	4th year	Utilisation and conservation of snakes: case study from ball python (*Python regius*) in Benin.	*Wildlife /protected areas management*
22	MAMA Djaouga	5th 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*
23	MALIKI Rafiou	4th 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*
24	DJOGBÉNOU Paul	5th year	Analyse des processus d'élaboration et de mise en œuvre des plans d'aménagement participatif des forets classées au Bénin: développement d'un modèle réussi et durable.	*Protected areas management*
25	DJODJOUWIN Laurent	5th year	Dynamique de croissance des espèces introduites en plantations d'enrichissement dans le sud et le centre Bénin.	*Plant ecology and management*

26	AGONYISSA Didier	5th 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*
27	AGBANI Onodjè Pierre	5th year	Etat de conservation et viabilité des populations de quelques espèces ligneuses soudaniennes menacées du Bénin.	*Plant ecology and management*
28	HESSOU Comlan*	4th year	Ecologie de *Caesalpinia Bonduc* au Bénin.	*Plant ecology and management*
29	SINSIN C. A. Franck	3rd 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*
30	KOWIYOU Yessoufou	3rd year	Community phylogenetics of south African flora: case study of Kruger National Park, South Africa.	*Plant ecology and management*
31	HOUNDANTODE Justin	4th 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*
32	ZOFFOUN Alex	4th year	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.	*Grassland ecology*

(*) : PhD already defended in earlier 2011

Appendix 2: Completed agronomist engineer degree in 2010

N°	Student full name	Research topics	Fields of Research
1	Padonou Elie Antoine	Contribution on domestication of *Jatropha curcas* L.: Study of ecophenotypic variability.	*Agroforestry*
2	Lokonon Bruno	Structure et ethnobotanique de *Dialium guineense* Willd., *Diospyros mespiliformis* Hochst. Ex A. Rich. et *Mimusops andongensis* Hiern. en populations dans le Noyau Central de la Forêt Classée de la Lama (Sud-Bénin).	*Dendrométrie et Ethnobotanique*

Appendix 3: Completed PhD thesis in 2010

N°	Student full name	Diploma	Research topics	Institution/Specialisation
1	Teka Oscar	PhD	Development of a method for analyzing space relevant processes in developing countries: the case of the costal area of Benin	University of Karlsruhe

Appendix 4: Articles published in peer-review journal with IF in 2010

Disciplines	N°	Authors' Names	Title of the article	Journals	Impact Factor
Forest Genetics and Forest Tree Breeding	1	Ekué, M.R.M., Gailing, O., Vornam, B. and Finkeldey, R.	Assessment of the domestication state of ackee (*Blighia sapida*) in Benin based on AFLP and microsatellite markers.	*Conservation Genetics* 1-15. DOI: 10.1007/s10592-010-0155-z.	1.849
Ethnobotany	2	Ekué, M.R.M., Sinsin, B., Eyog-Matig O. and Finkeldey, R., 2010.	Uses, traditional management, perception of variation and preferences in ackee (*Blighia sapida*) fruits traits in Benin: implications for domestication and conservation.	*Journal of Ethnobiology and Ethnomedicine* 6: 12.	1.5
Ethnobotany and Forest Economics	3	Fandohan B, Assogbadjo A.E., Glèlè Kakaï R, Kyndt T, De Caluwé E, Codjia JTC, Sinsin B	*Women's traditional knowledge, use value and the contribution of tamarind (Tamarindus indica L.) to rural households' cash income in Benin.*	*Economic Botany 64 (3): 248-259*	0.88
Forestry economics	4	Vodouhê G.F. Coulibaly O., Adégbidi A., Sinsin B.	Community Perception of Biodiversity Conservation within Protected Areas in Benin.	*Forest Policy and Economics* 12 (7): 505-512	1.155
Plant sciences	5	Ndjiondjop M.N., Manneh B., Cissoko M., Drame N.K., Glèlè Kakaï R., Bocco R., Baimey H., Wopereis M. (2010).	Drought resistance in an interspecific backcross population of rice (*Oryza* spp.) derived from the cross WAB56-104 (*O. sativa*) × CG14 (*O. glaberrima*).	*Plant Sciences*, 179: 364–373.	2.05
Plant Ecology	6	Assogbadjo A.E., Glèlè Kakaï R.., Sinsin B. & Pelz, Dieter	Structure of *Anogeissus leiocarpa* Guill., Perr. natural stands in relation to anthropogenic pressure within Wari-Maro Forest Reserve in Benin.	*African Journal of Ecology* 48 (3): 644–653. DOI: 10.1111/j.1365-2028.2009.01160.x	0.62

Disciplines	N°	Authors' Names	Title of the article	Journals	Impact Factor
Plant sciences	7	Cuni Sanchez A., Haq N. & Assogbadjo A.E.	Variation in baobab leaf morphology and its relation to drought tolerance.	*Genetic Resource and Crop Evolution* 57:17–25.	1.032
Plant ecology	8	Houehounha R., Avohou H.T., Gaoue O.G., Assogbadjo A.E., Sinsin B.	Weed removal improves coppice growth of *Daniellia oliveri* and its use as fuelwood in traditional fallows in Benin.	*Agroforestry Systems* 78: 115–125.	1.016
Social science and management	9	Teka O. & Vogt J.	Social perception of natural risks by local residents in developing countries—the example of the coastal area of Benin.	*The Social Science Journal* (47) 215–224	0.253
Environmental science	10	Vogt J., Teka O. & Sturm U.	Modern issues facing coastal management of the fishery industry: A study of the effects of globalization in coastal Benin on the traditional fishery community.	*Ocean & Coastal Management* (53) 428-438	0.815
Wildlife ecology	11	Bauer H., de Iongh. H., Sogbohossou E.	Assessment and mitigation of human-lion conflict in West and Central Africa	*Mammalia* 74 (2010): 363–367 ; doi : 10.1515/MAMM.2010.048	0.526
Development Economics	12	Zannou A.	Determinants of intra-ECOWAS trade flows.	*African Journal of Business Management*, 4(5): 678-686	1.105
Economics of pests and diseases	13	Sikirou R., Zannou A., Gbèhounou G., Tosso F., Assogba Komlan F.	Fungicide effect of banana column juice on tomato southern blight caused by *Sclerotium rolfsii*: Technical and economic efficiency.	*African Journal of Agricultural Research* 5(23):3230-3238.	0.09
Plant ecophysiology	14	Kindomihou V. Meerts P., Kjelgren R., Sinsin B.	Effect of moisture stress on silica accumulation in three tropical grass species (*Pennisetum purpureum*, *Panicum maximum* Jacq and *P. maximum* var. Orstom C1).	*American Eurasian Journal of Agricultural and Environmental Sciences* 8(5) (2010): 530-537.	2.110

Appendix 5: Articles published in peer-review journal without IF in 2010

Disciplines	N°	Authors' Names	Title of the article	Journals
Pastoralism	1	Oumorou M., B. A. Aboh, S. Babatounde, M. Houinato & B. Sinsin	Valeur pastorale, productivité et connaissances endogènes de l'effet de l'invasion, par *Hyptis suaveolens* L. Poit., des pâturages naturels en Zone soudano-guinéenne (Bénin).	*International Journal of Biological and Chemical Sciences* 4(4): 1262-1277,, 2010
Conservation Biology	2	Oumorou M., J. Dah-Dovonon, B. A. Aboh, M. Hounsoukaka & B. Sinsin,	Contribution à la conservation de *Synsepalum dulcificum* : Régénération et importance socio économique dans le Département de l'Ouémé (Bénin).	*Annales des Sciences Agronomiques,* 14 (1) 101-120, 2010
Ethnobotany	3	Djagoun C. A. M. S. , R. Glèlè Kakaï, Konnon D-D., Séwade C., Kouton M., Bonou W., Gouwakinnou G., Fandohan B.	Potentiel des Ressources Végétales Forestières Alimentaires et Médicinales de la Forêt Classée de l'Ouémé Supérieur et N'Dali au Nord Bénin	*Fruit, Vegetable and Cereal Science and Biotechnology 4 (*Special Issue 1): 47-54 ©2010 Global Science Books.
Ecology	5	Djégo J., Oumorou M., Adjahossou B. S., Djégo S., & Sinsin B.	Climatic modifications of the undergrowth created by exotic trees plantations: what effect on the local plant diversity?	*Annales des Sciences Agronomiques* 14 (2 :) 257-280, 2010
Ecology	6	Akouehou G.S., Djossa B.A., Ahononga F.C., Awessou B.K. & Sinsin B. A.	Role of community forest reserves in wildlife conservation in Benin, West Africa	*International Journal of Biological and Chemical Sciences* 4(4): 1318-1327
Ecology	7	Djossa B. A., Adomou A. C. & Sinsin B.	Communautés végétales et diversité des chiroptères dans les forêts de Niaouli et de Lokoli au Sud du Bénin	*International Journal of Biological and Chemical Sciences* (6): 2146-2159 (2010):
Conservation Biology	8	Fandohan B., Assogbadjo A.E., Glèlè Kakaï R., Sinsin B. & Van Damme P.	Impact of habitat type on the conservation status of tamarind (*Tamarindus indica* L.) populations in the W National Park of Benin	*Fruits* 65, 1–9, 2010
Seed ecology	9	Fandohan B., Assogbadjo A.E., Glèlè Kakaï R. Sinsin B.	Provenance variation in seed morphometric traits, germination and early seedling growth performances of Tamarindus indica L.	*International Journal of Biological and Chemical Sciences,* 4(4): 1102-1109 (2010)
Seed ecology	10	Gnanglè P. C., Glèlè Kakaï R., Oumorou M., N'djolosse K., Bonou W., Sokpon N. (2010).	Tests de croissance de jeunes plants de néré (*Parkia biglobosa*, Jack, R. Br.) en pépinière.	*International Journal of Biological and Chemical Sciences*, 4(6): 1939-1952.
Ethnobiology	11	Djogbénou P., Glèlè Kakaï R., Sinsin B. (2010).	Comparative analysis of stakeholders' perceptions of participatory forest management success in Benin.	*International journal of biodiversity and conservation*, 2(12):395-404.

Disciplines	N°	Authors' Names	Title of the article	Journals
Agroforestry	12	Gbèmavo D.S.J.C., Glèlè Kakaï R., Assogbadjo A.E., Katary A., Gnanglè P. (2010).	Effet de l'ombrage du Karité sur le rendement capsulaire du cotonnier dans les agro-écosystèmes cotonnier-karité du Nord Bénin.	*Tropicultura*, 28(4): 193-199.
Conservation Genetics	13	Assogbadjo A.E, Glèlè Kakaï R., Kyndt T., Sinsin B. (2010).	Conservation Genetics of Baobab (*Adansonia digitata* L.) in the Parklands Agroforestry Systems of Benin (West Africa).	*Not. Bot. Hort. Agrobot. Cluj* 38(2):136-140.
Biometry	14	Glèlè Kakaï R., Pelz D. R. (2010).	Asymptotic error rate of linear, quadratic and logistic rules in multi-group discriminant analysis.	*International journal of applied mathematics and statistics.* 18(10): 69-81.
Biometry	15	Glèlè Kakaï R., Pelz D. R., Palm R. (2010).	On the efficiency of the linear classification rule in multi-group discriminant analysis.	*African Journal of Mathematics and Computer Science Research.* 3(1): 19-25.
Ecology	16	Oumorou M., Sinandouwirou T., Kiki M., Glele Kakaï R., Mensah G., Sinsin B. (2010).	Disturbance and population structure of *Vitex doniana* Sw. in northern Benin, West Africa.	*International journal of biological and chemical sciences,* 4(3): 624-632.
Crop Sciences	17	Dagbénonbakin G. D., Agbangba E. C., Glèlè Kakaï R., Goldbach H. (2010).	Preliminary diagnosis of the nutrient status of cotton (*Gossypium hirsutum* L) in Benin (West Africa).	*Bulletin de la Recherche Agronomique du Bénin*, 64: 32-45.
Environmental science	18	Teka O. & Vogt J. (2010)	Method of assessment of natural risks in tropical countries- Example of the coastal zone of Benin. *Geographic works of Bayreuth*. 98-107p	*Geographic Works of Bayreuth: 98-107*
Wildlife Conservation	19	Houessou G. Laurent, Sinsin Brice, Lougbegnon O. Toussaint, & Jean T. Claude Codjia (2010)	Gestion communautaire de la faune sauvage dans la forêt classée des Trois Rivières en République du Bénin	*Ahoho 5: 72-87*
Plant nutrition and soil science	20	Dagbénonbakin G.D., Agbangba E.C., Kindomihou V. (*2010*)	Comparaison du Système Intégré de Diagnostic et de Recommandation et de la Méthode de la Valeur Critique pour la détermination du statut nutritionnel de l'ananas (*Ananas comosus* (L.) Merr) variété Cayenne Lisse au Bénin.	*International Journal of Biological and Chemical Sciences 4 (5), 1550-1563.*
Plant nutrition and soil science	21	Agbangba C E, Dagbénonbakin D G, Kindomihou V. (2010).	Etablissement des normes du Système Intégré de Diagnostic et de Recommandation de la culture d'ananas (*Ananas comosus* (L.) Merr) variété Pain de sucre en zone subéquatoriale du Bénin.	*Annales de l'Université de Parakou, Série Sciences Naturelles et Agronomie*, 1 : 51-69.

Appendix 6: Articles in press in peer-review journal with IF in 2010

Disciplines	N°	Authors' Names	Title of the article	Journals	Impact Factor
Biogeography	1	Gaubert P., Machordom A., Morales A., Lopèz-Bao J.V., Veron G., Amin M., Barros T., Basuony M., Djagoun Do Linh San E., Fonseca C., Geffen E., Ozkurt S. O., Cruaud C., Couloux A. and Palomares F.	Comparative phylogeography of two African carnivorans presumably introduced into Europe: disentangling natural versus human-mediated dispersal across the Strait of Gibraltar	*Journal of Biogeography:* doi:10.1111/j.1365-2699.2010.02406.x	4.087
Genetic Resources Conservation	2	Fandohan B., Assogbadjo A.E., Glele Kakaï R, Kyndt T, Sinsin B.	Quantitative morphological descriptors confirm traditionally classified morphotypes of *Tamarindus indica* L. fruits	*Genetic Resources and Crop Evolution:* doi: 0.1007/s10722-010-9575-3.	1.032
Conservation Biology	3	Fandohan B, Assogbadjo A.E., Glele Kakaï R., Sinsin B.	Effectiveness of a protected areas network in the conservation of *Tamarindus indica* (Leguminosae-Caesalpinioideae) in Benin	*African Journal of Ecology:* doi: 10.1111/j.1365-2028.2010.01228.x	0.62
Ethnobiology	4	Vodouhê G.F., Coulibaly O., Biaou G., Sinsin B.	Traditional Agroforestry Systems and Biodiversity Conservation in Benin (West Africa).	*Agroforestry Systems*	1.016
Ethnobiology	5	Vodouhê G.F., Adégbidi A., Coulibaly O., Sinsin B.	*Parkia biglobosa* (Jacq.) R.Br. ex Benth. harvesting as a tool for conservation and source of income for local people in Pendjari Biosphere Reserve.	*Acta Botanica Gallica*	0.083
Ethnobiology	6	Assogbadjo A.E., Glèlè Kakaï R., Adjallala F.H., Azihou A.F., Vodouhê G.F., Kyndt T., Codjia J.T.C.	Ethnic differences in use value and use patterns of the threatened multipurpose scrambling shrub species (*Caesalpinia bonduc* L.).	*Journal of Medicinal Plants Research*	0.590
Plant sciences	7	Assogbadjo A.E., Glèlè Kakaï R., Edon S. Kyndt T. & Sinsin B.	Natural variation in fruit characteristics, seed germination and seedling growth of *Adansonia digitata* L. in Benin.	*New Forests*: DOI 10.1007/s11056-010-9214-z	0.845
Wildlife ecology	8	Sogbohossou E.A., de Iongh H.H., Sinsin B., de Snoo G. & Funston P.	*Livestock - predator conflict around Pendjari Biosphere Reserve, Northern Benin*	*Oryx*	1.693
Restoration Ecology/Conservation	9	Avakoudjo J., Kindomihou V. & Sinsin B.	Farmers' perception and response to soil erosion while abiotic factors are the driving forces in sudanian zone of Benin	*American Educational Research Journal*	2.236

Appendix 7: Articles in press in peer-review journal without IF in 2010

Disciplines	N°	Authors' Names	Title of the article	Journals
Ethnobotany	1	Avocèvou-Ayisso C., Avohou T.H., Oumorou M., Dossou G. & Sinsin B.	Ethnobotany of *Pentadesma butyracea* in Benin: a quantitative approach.	*Ethnobotany Research and Applications*
Climate change	2	Glèlè Kakaï R., Gnanglè P. C., Assogbadjo A.E., Vodounon S., Yabi J. & Sokpon N.	Tendances climatiques passées, modélisation, perceptions et adaptations locales au Bénin.	*Climato.*
Animal sciences	3	Babatoundé S., Glèlè Kakaï R., Houinato M., Alkoiret G.A. & Mensah G. A.	Intake and digestibility of native and exotic grasses fed *ad libitum* to Djallonke sheep in south Benin.	*Journal of agriculture, science and technology*.
Forest management	4	Djogbenou C. P., Arouna O., Glèlè Kakaï R. & Sinsin B.	Analyse comparative des profils des Plans d'Aménagement Participatifs des forêts classées du Bénin.	*VertigO.*
Socio-Economics	5	Houngbo, N. E., Floquet, A. & Sinsin, B.	Facteurs favorisant la pauvreté chronique au Bénin	*Les Annales de la FLASH*
Socio-Anthropology	6	Ouassa Monique	La déforestation dans la commune de Toucountouna : acteurs et logiques.	*Les Annales de la FLASH*

Appendix 8: Articles under review in peer-review journal with IF in 2010

Disciplines	N°	Authors' Names	Title of the article	Journals	Impact Factor
Wildlife ecology	1	Djagoun C. A. M. S., Djossa B., Mensah G. A. & Sinsin B.	Sport hunting as a driver of forest ungulate habitat use in the Pendjari Biosphere Reserve: comparison between two browser bovids of contrasting body size	*African Journal of Ecology*	0.62
Ecological economics	2	Vodouhê G.F., Gélinas N., Coulibaly O. & Sinsin B.	Financial Valuation of Non-Timber Forest Products in Savanna Formation in Benin.	*Ecological Economics*	2.422
Agroforestry	3	Assogbadjo A.E., Glèlè Kakaï R.; Vodouhê G.F., Maxted N., 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*	1.155
Conservation genetics	4	Assogbadjo A.E., Glèlè Kakaï R., Kyndt T., Fandohan B., Hardy O.J., 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*	1.402
Plant Ecology	5	Assogbadjo A.E., Chadare F. J., Glele Kakaï R., Fandohan B., Baidu-Forson J.J.	Effects of physicochemical constituents of the soil and geographic provenance of individuals on variation in biochemical composition of baobab pulp, leaves and seeds	*Agriculture, Ecosystems and Environment*	3.462
Domestication	6	Gouwakinnou G.N., Assogbadjo A.E., Lykke A.M. & Sinsin B.	Phenotypic variations in fruits and potential for multi-criteria selection in *Sclerocarya birrea* [(A.Rich) Hochst] subsp. birrea	*Scientia Horticulturae*	1.155
Ethnobiology	7	Houehanou T.D., Assogbadjo A.E., Glele Kakaï R., Houinato M. & Sinsin B.	Valuation of local preferred uses and traditional ecological knowledge in relation to three multiuse tree species in Benin (West Africa)	*Forest Policy and Economics*	1.485
Agroforestry	8	Gouwakinnou G.N., Lykke A.M., Djossa A.B. & Sinsin B.	Folk perception of sexual dimorphism, sex ratio and spatial repartition: implications for population dynamics of Sclerocarya birrea [(A.Rich) Hochst] populations in Benin, West Africa	*Agroforestry Systems*	1.016
Forest Ecology	9	Badru M., Cakpo Y., Monty F.	Influence of edge and host specificity on distribution of Pteridophytes in Kibale National Park	*African Journal of Ecology*	0.62
Forest/Plant ecology	10	Laurent G. Houessou, Anne Mette Lykke, Madjidou Oumorou, Brice Sinsin	Distribution des communautés végétales suivant le gradient allant des zones protégées aux zones non protégées au niveau de la Réserve de Biosphère du W au Bénin	*Applied Vegetation Science*	1.349

Appendix 9: Articles under review in peer-review journal without IF in 2010

Disciplines	N°	Authors' Names	Title of the article	Journals
Biogeography	1	Fandohan B, Assogbadjo A.E., Glele Kakaï R. & Sinsin B.	Geographical distribution, tree density and fruit production of *Tamarindus indica* (Fabaceae) across three ecological regions in Benin	*Fruits*
Ethnobotany	2	Gouwakinnou G. N., Lykke A.M, Assogbadjo A. E. & Sinsin B	Local knowledge, pattern and diversity of use of *Sclerocarya birrea*	*Journal of Ethnobiology and Ethnomedicine*
Agroforestry, Forestry	3	Houehanou T.D., Kindomihou V. & Sinsin B.	Effectiveness of conservation areas in protecting shea tree against mistletoes hemiparasitic plants (Loranthaceae) in Benin (West Africa)	*Plant Ecology and Evolution*

Appendix 10: Publications in proceedings in 2010

Field of research	N°	Authors' Name	Title	Full References
Natural resources Conservation & Communication and Innovation	1	Kpéra, G.N., Mensah, G.A., Sinsin, B. A., Tossou, R., Eilers, K., van der Zijpp, A. & Aarts N.	Human-crocodile interaction: empowerment of local people to deal with crocodiles around agropastoral dams in northern Benin	Actes du 2ème Congrès du Groupe des Spécialistes des Crocodiles sur la promotion et la conservation des crocodiliens en Afrique de l'Ouest, Ranching de Nazinga, Burkina Faso, 2-6 mars 2010,135-144.
Natural resources Conservation	2	Kpéra, G.N., Pomalegni, S.C.B., Mensah, G.A. & Sinsin, B.A	Statut des crocodiles et influence des facteurs physico-chimiques de l'eau sur la répartition des crocodiles dans la Réserve de Biosphère Transfrontalière du 'W' du Bénin.	Actes du 2ème Congrès du Groupe des Spécialistes des Crocodiles sur la promotion et la conservation des crocodiliens en Afrique de l'Ouest, Ranching de Nazinga, Burkina Faso, 2-6 mars 2010, 145-173.
Natural resources Conservation	3	Pomalegni, S.C.B., Kpéra, G.N., Mensah, G.A. & Sinsin B.A.	Point de la préservation et de la gestion des crocodiles au Benin	Actes du 2ème Congrès du Groupe des Spécialistes en crocodiles sur la promotion et la conservation des crocodiliens en Afrique de l'Ouest, Ranching de Nazinga, Burkina Faso, 2-6 mars 2010, 128-131.

Appendix 11: Abstracts in books of abstracts in 2010

Field of research	N°	Authors' Name	Title	Full References
Plant ecology	1	Deleke Koko K. I. E., Hahn-Hadjali K. & Sinsin B.	Analyse de l'abondance et de la densité de régénération des principales plantes galactogènes utilisées dans les terroirs riverains à Réserve de Biosphère de la Pendjari.	
Ethnobiology	2	Deleke KOKO K. I. E. & Sinsin B.	Estimation de la valeur d'usage des plantes utilisées pour les soins gynécologiques dans les terroirs autour de la Réserve de Biosphère de la Pendjari**.**	
Wildlife ecology and conservation	3	Djagoun C.A.M.S, Sinsin B.	Déterminisme dans le choix de l'habitat chez le guib harnaché et le céphalophe à flanc roux dans la Réserve de Biosphère de la Pendjari (Nord Bénin)	Abstract book of « Journées Scientifiques Internationales de Lomé (JSIL) XIV^{ème} édition, 25-29 Octobre 2010 CAMPUS DE LOME – TOGO »
Wildlife ecology and conservation	4	Djagoun C.A.M.S., Gaubert Philippe	Small carnivores from southern Benin: a preliminary assessment of diversity and hunting pressure.	International Forestry Review Vol. 12 (5), 2010.
Wildlife ecology and conservation	5	Djagoun C.A.M.S, Sinsin B.	Combining indigenous and scientific knowledge to understand habitat use of bushbuck (*Tragelaphus scriptus*) and red-flanked-duiker (*Cephalophus rufilatus*) in Pendjari Biosphere Reserve (Northern Benin).	International Forestry Review Vol. 12 (5), 2010.
Forest /Plant Ecology	6	Gouwakinnou G.N., Sinsin B	Predicting current and future potential distribution areas of Sclerocarya birrea subsp. birrea, in Benin (West-Africa).	International Forestry Review, vol. 12(5):67-68.
Ethnobiology	7	Gouwakinnou, G. N., Lykke, A.M, Assogbadjo A. E., and Sinsin B	Valuation of use pattern and local knowledge of *Sclerocarya birrea* in Benin	International Symposium on Indigenous Fruit Trees for Dryland Africa: Domestication for Use in a Changing Environment. Centre CIEVRA, Allada (Republic of Benin) 25-27 October 2010
Ethnobiology	8	Gouwakinnou, G.N., Lykke, A.M., Djossa A.B., Sinsin, B.	Folk perception of sexual dimorphism, sex ratio and spatial repartition: implications for population dynamics of *Sclerocarya birrea* [(A.Rich) Hochst] populations in Benin, West Africa	International Symposium on Indigenous Fruit Trees for Dryland Africa: Domestication for Use in a Changing Environment. Centre CIEVRA, Allada (Republic of Benin) 25-27 October 2010.
Ethnobiology	10	Sogbohossou E.A., Sinsin B., de Snoo G. & de Iongh H.H.	Perceptions and Attitudes of local populations towards carnivores and livestock-carnivores conflicts	Student Conference in Conservation Science, Cambridge, March 2010

Field of research	N°	Authors' Name	Title	Full References
			in Pendjari Biosphere Reserve.	
Forest/Plant ecology	11	Avakoudjo Julien, Toko Ismaïla., Oumorou Madjidou & Sinsin Brice.	Contribution to the" Donga" and "plateau" plant communities' study in the W Transboundary Reserve of Biosphere in Karimama district	ABEPA
Soil science	12	Avakoudjo Julien, Akponikpè Pierre, Kindomihou Valentin & Sinsin Brice	Eroded sediment and run-off assessment of "donga" and "plateau" in Sudanian zone of Benin	Abstract book of « Journées Scientifiques Internationales de Lomé (JSIL) XIV^{ème} édition, 25-29 Octobre 2010 CAMPUS DE LOME – TOGO »
Forest/Plant ecology	13	Julien Djègo, Julien Avakoudjo, Auguste Avodé, Mariatou Sounon & Brice Sinsin	Mise en évidence des conditions optimales de production, de récolte et de séchage de *Artemisia annua* L. au Bénin	Colloque International sur les plantes antipaludiques utilisées en médécine traditionnelle au Bénin
Biodiversity, Genetics, Ecophysiology and Adaptation Strategies	14	Kombienou I. P. D., Kindomihou V, Cakpo Chichi E, Mensah GA, Sinsin B.	Contribution of the study of Agrobiodiversity on the chain of Atacora perimeter of Boukombe in north west Benin	International Symposium on Indigenous Fruit Trees for Dryland Africa: Domestication for Use in a Changing Environment Centre CIEVRA, Allada (Republic of Benin) 25-27 October 2010
Organic agriculture/ Sustainable Management of Natural Resources	15	Houndantode Justin, Kindomihou Valentin, Amadji Guillaume, Tonon Fidèle, Boko Michel, Sinsin Brice	Use of sewage sludge in Market Gardening in Southern Benin: Physicochemical Analyses of Targeted Soils and Agronomic Performances of Three Types of Substrates Treated in the Amaranthe (*Amaranthus cruentus* Linn.) Cropping	Abstract book of « Journées Scientifiques Internationales de Lomé (JSIL) XIV^{ème} édition, 25-29 Octobre 2010 CAMPUS DE LOME – TOGO »

Appendix 12: Technical Reports and books in 2010

Field of research	N°	Authors' Name	Title	References
Biodiversity	1	Sinsin B., Djègo J., Houngbo E., Houéhounha R., Lougbégnon T., Orékan V., Tchtintchin Q.	Etude de la diversité biologique dans les périmètres de reboisement de Kilir et d'Abomey appartenant à l'aire d'intervention du PGFTR au Bénin.	Rapport d'étude LEA-FSA/PGFTR, Bénin, 2010.110p. + Annexes
Biodiversity & Conservation	2	Sinsin B., Assogbadjo A.E., Dossou-Yovo B., Tenté B., Clédjo P., Ouassa M.	Réalisation de la monographie des sites RAMSAR des complexes Est et Ouest identifiés pour la conservation communautaire de la biodiversité et élaboration de la stratégie du gel du foncier.	Rapport synthèse LEA-FSA-UAC, 27 pages + annexes
Social sciences	3	Sogbohossou E.A. & Sinsin B.	Managing human-carnivores conflicts in West Africa.	*Manual for Protected Areas Management in Francophone Africa*. Editor P. Triplet. (available online www.awely.org)
Biometry	4	Glèlè Kakaï R.	Règles de classement et taux d'erreur en analyse discriminante	Edition Européenne Universitaire, Allemagne, 237p.

Appendix 13: Participation at workshops/conferences in 2010

N°	Title and period	Type of presentation (oral, poster, ..)	Name of the participants from LEA
1	Seminar on state of biodiversity in Republic of Benin ESPACE AFRIQUE (CIEVRA), Abomey-Calavi (Bénin) 05, 06 and 07 July 2010	Oral communication	André Boya Aboh Marcel Houinato Madjidou Oumorou Brice Sinsin Julien Djégo
2	International Symposium on Indigenous Fruit Trees for Dryland Africa: Domestication for Use in a Changing Environment 25 – 27 October 2010	Oral communication	Carolle M.A. Avocèvou-Ayisso K. I. E. Deleke Koko Achille E. Assogbadjo Belarmain Fandohan Gérard Gouwakinnou Solange Edon Emeline Assédé Gerard N. Gouwakinnou

3	The International Youth Conference on Biodiversity in Aichi 2010, August 23-27, 2010, Nagoya, Japan.	Oral communication	Akomian Fortuné Azihou
4	XIV^{ème} édition des Journées Scientifiques Internationales de Lomé (JSIL 2010), 25-29 octobre 2010.	Oral communication	Fortuné Akomian Azihou C.A.M.S. Djagoun Julien Avakoudjo, Faustin Assogba Romain Glèlè Kakaï
5	XIXth Congress of AETFAT (Association pour l'Etude de la Taxonomie de la Flore d'Afrique Tropicale) on the topic *« Diversity of African Plants, Systematics and Sustainable Development* », Antananarivo, Madagascar. 25 April to May 1, 2010	Oral communications Posters	K. I. E. Deleke Koko Achille E. Assogbadjo Ismail Toko Brice Sinsin Eméline Assédé
6	National Seminary on the Biodiversity Conservation, Fondation Espace Afrique (CIEVRA), 6-8 July 2010.	Oral communication	C.A.M.S. Djagoun
7	International Union for Forest Research Organization (IUFRO)/16th - 21th Aug. 2010/ Seoul, Republic of Korea	Oral communication	C.A.M.S. Djagoun
8	XXIII IUFRO World Congress, 23-28 August 2010, Seoul, Republic of Korea	Oral communication	C.A.M.S. Djagoun Gerard N. Gouwakinnou
9	Colloque international sur les plantes antipaludiques utilisées en médecine traditionnelle. Centre CIEVRA les 5, 6 & 7 Juillet 2010, Bénin.	Oral communication	Julien Djègo Julien Avakoudjo
10	"Natural Resources 2010", Leibniz University Hannover, Germany 25-27 October 2010.	Oral communication	M.R.M. Ekué
11	Brown International Advanced Research Institutes. Brown University, Providence, Rhode Island, United States of America, 11-26 June 2010.	Oral communication	Adandé Belarmain Fandohan
12	22nd International CODATA Conference: "Scientific Information for Society: Scientific Data and Sustainable Development". (Cape Town, South Africa, 24-27 October 2010).	Poster (Capons'production in Benin)	Windékpè T. Koura
13	Final Workshop of BIOTA West Africa, Ouagadougou	Oral communication	Thierry Houehanou
14	12th Scientific Week of the AUF-BIOVEG Network. Cluj-Napoca (Roumania); 27-29 September 2010.	Oral communication	Achille E. Assogbadjo
15	5th Agriculture Science Week and FARA General Assembly Ouagadougou (Burkina-Faso), 19-24 July 2010.	Poster	Achille E. Assogbadjo
16	Coastal Impact and Environmental Change along the West African Coastline. Conference on GEOSS Support for Decision-Making in the Coastal Zone: Managing and Mitigating the Impacts of Human Activities	Oral communication	Oscar Teka

	and Natural Hazards in the Coastal Zone. Cotonou, 14 to 18 February 2010.		
17	2nd International workshop of Convergence of Sciences-Strengthening Innovation System Programme (CoS-SIS), Bamako, Mali, 21-25 June 2010.	Oral communication	Gnanki Nathalie Kpera
18	Wageningen Institute of Animal Sciences days, Wageningen, The Netherlands, 28-29 January 2010.	Poster	Gnanki Nathalie Kpera
19	2nd Workshop of Crocodile Specialist Group Crocodiles: promotion and conservation of West Africa crocodilians, Ranching of Nazinga, Burkina Faso, 2-6 March 2010.	Oral communication	Gnanki Nathalie Kpera
20	Carnivores Conference: Managing Human-Wildlife Conflicts, The Way Forward. Cameroon, November 2010.	Oral communication	Etotépé A. Sogbohossou
21	Status of biodiversity in Benin. Cotonou, July 2010.	Oral communication	Etotépé A. Sogbohossou
22	Student Conference in Conservation Science, March 2010.	Oral communication	Etotépé A. Sogbohossou
23	Characterization of the habitat of an endangered species (*Afzelia africana* Sm.) in the Lama Forest reserve (Benin, West Africa). 21st *annual session of The International Environmetric Society (TIES/ISI)*, Margarita Islands, Venezuela with paper presentation on 20-25 June, 2010..	Oral communication	Romain L. Glèlè Kakaï
24	Ethnic differencies in use value and use patterns of the threatness multipurpose scrambling shrub (*Ceasalpinia bonduc* L.) in Benin. Colloque Plantes Alimentaires, Médicinales et Cosmétiques en Zone Sahélienne ». Dakar, 20-22 Octobre 2010.	Oral communication	Romain L. Glèlè Kakaï
25	Facteurs favorisant la pauvreté chronique au Bénin, October 2010.	Oral communication	N. Emile Houngbo
26	Contribution de la croissance économique à la réduction de la pauvreté en milieu rural au Bénin entre 2000 et 2007, October 2010.	Oral communication	N. Emile Houngbo
27	Pratiques agricoles de conservation des terres et réduction de la pauvreté rurale au Bénin : Cas de l'agroforesterie, de la jachère naturelle et des plantations, December 2010.	Oral communication	N. Emile Houngbo
28	Colloque international sur les plantes antipaludiques utilisées en médecine traditionnelle. CIEVRA Bénin du 05 au 07 juillet 2010.	Oral communication	Julien Avakoudjo Julien Djègo
29	Roundtable on « Gap analysis in organic agriculture» University of Agriculture of Abeokuta, Ogun state, Abeokuta, February 2010, Nigeria.	Oral communication	Valentin Kindomihou
30	International workshop on « Food, Fuel & Society », 12th October, 2010, University of Missouri, Columbia, Missouri, USA.	Oral communication	Valentin Kindomihou
31	Saturday Morning Science Programme, University of Missouri, Columbia, USA. October 2010.	Fellowship	Valentin Kindomihou

32	Atelier sur l'Agrobiodiversité: « Des hommes et des Plantes : Outils et Méthodes d'analyse » à l'Institut Universitaire Agronomique et Vétérinaire Hassan II, Rabat, Maroc, 2 - 15 mai 2010.	Oral communication	Monique Ouassa
33	Conférence sur les violences faites aux femmes dans l'espace européen et en Afrique : Parlement Européen Bruxelles en septembre 2010.	Oral communication	Monique Ouassa
34	Colloque à l'Université de Lomé du 25 au 29 octobre 2010 sur : la contribution de la recherche scientifique et technologique à la réduction de la pauvreté en Afrique de l'Ouest.	Oral communication	Monique Ouassa
35	Atelier sur l'éthique dans la recherche en sciences sociales organisée par l'ISBA en collaboration avec l'Université de Laval et de l'Université d'Abomey-calavi.	Oral communication	Monique Ouassa
36	Formation organisée par l'ONG Internationale ''Terres Rouge'' sur DEVELOPPEMENT ET PSYCHOLOGIE DE L'ENFANT ET DE L'ADOLESCENT : Renforcement des connaissances et des capacités dans le domaine de l'éducation, des soins, de l'écoute et de la prise en charge psychosociale des enfants en danger. Porto-Novo, 29 juin - 2 juillet 2010.	Oral communication	Monique Ouassa

Appendix 14: Research projects of LEA in which you have been involved in 2010

N°	Title of the project	Sources of Funding	Objectives of the project	Status (ongoing or ended)
1	Sud-Expert-Plantes	IRD	•study at the regional level of plant resources and their habitats (savannah, planting or forest islands) • study of the impact of their operations on the different habitats in order to provide guidance on conservation policy •promote historical collections in the herbaria	**ongoing**
2	SUN Project	European Union (FP6)	Provide tools for sustainable use and management of natural vegetation in west Africa	Ended
3	DADOBAT Project	European Union (FP6)	Domesticating and developing baobab and tamarind in West Africa	Ended
4	UNDESERT	European Union (FP7)	Combat desertification and land degradation in order to mitigate their impacts on ecosystem services and, consequently, on human livelihoods, through improved understanding of the effects of desertification and degradation processes in Benin, Burkina Faso, Niger and Senegal.	Ongoing
5	Conception of LEA E-Library with Access Software	LEA	Capitalization of Documents (books, dissertation, Thesis, articles etc…)	Ended
6	BIOTA	German Government	Assessing and understanding the still existing West African biological richness, being the indispensable basis for the provision of vital ecosystem services and goods upon which the local populations depend.	Ended

N°	Title of the project	Sources of Funding	Objectives of the project	Status (ongoing or ended)
7	West African Network for Organic Agriculture Research and Training WANOART/ROAFRAB	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 • 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	Ongoing
8	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.	Ongoing

N°	Title of the project	Sources of Funding	Objectives of the project	Status (ongoing or ended)
			• 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	
9	Rift Dynamics, Up-lift and Climate Change: Interdisciplinary Research Linking Asthenosphere, Lithosphere, Biosphere and Atmosphere PROJECT C2	International Grant for financial support with research unit	• testing the hypothesis of the causal link between climatic and faunal change for faunal groups of different ecosystems • analyzing eastern African terrestrial and lacustrine community structure in temporal and geographical context • analyzing the evolutionary adaptation pattern in relation environmental change • extending the data base for paleoclimatic interpretations, i.e. for gastropod and bovid data • searching the impact of climatic and environmental variability on faunal composition and distribution of molluscan and bovid faunas in Eastern Africa	Ongoing

Appendix 15: Research Grants in 2010

N°	Title of Grant	Beneficiaries	Status (ongoing or ended)
1	International Foundation for Science (IFS), 2010	A. Bruno Djossa	Ongoing
2	Organization for Women in Science for the Developing World (OWSDW)	A. T. Solange Edon	ongoing
3	Grant of Man and Biosphere Reserve program of United Nations Educational, Scientific, and Cultural Organization (UNESCO) for young researcher. France Research Fellowship.	Fifanou G. Vodouhê	Ongoing
4	International Foundation for Science (IFS), 2009	Gerard N. Gouwakinnou	Ongoing
5	Rufford Small Grant for Nature Conservation (RSG), UK, 2010	Gerard N. Gouwakinnou	Ongoing
6	Abdou Salam Ouédraogo Fellowship on Plant Genetic Resources, 2010	Gerard N. Gouwakinnou	Ongoing
7	Rufford Small Grant (RSG) for Nature Conservation (Renew)	Achille E. Assogbadjo	Ongoing
8	Rufford Small Grant for Nature conservation	Nathalie Kpera Hugues Akpona	ongoing
9	Charlotte Fellowship, African Wildlife Foundation)	Etotépé A. Sogbohossou	Ongoing
10	TBA Grant for training in forest Ecology in Kibale Forest	Yvonne CAKPO	Ended
11	GTI Grant for training on Cerambycidea xylophageous in Brussel.	Yvonne CAKPO	Ended
12	Bourse Locale UAC-CUD	Emeline P.S. Assédé	Ongoing

Appendix 16: Prizes and nomination in 2010

N°	Title of prize / nomination	Nominee
1	Prize of the Belgian Development Cooperation	Achille E. Assogbadjo
2	Third prize Best talk at SCCS, Cambridge	Etotépé A. Sogbohossou

Appendix 17: Visitors received in 2010

N°	Full names of visitors	Provenance	Responsibles in LEA	Topics
1	ZACHEE Priscilla	Université de Bordeaux (France)	A. Bruno Djossa	Les Damans au Bénin : Éléments d'éthologie et Ethnozoologie
2	Sturm Ulrike	Germany	Oscar Teka	Coastal zone management
3	Lionel Ruidavets	ENSA-Toulouse (France)	Achille E. Assogbadjo	La conduite de l'agroforesterie de *Caesalpinia bonduc* et d'*Afzelia africana* au Bénin

ABSTRACTS OF ARTICLES IN PEER REVIEWED JOURNALS

(Published, *in press* & under review)

1. Assessment of the domestication state of ackee (*Blighia sapida* K.D. Koenig) in Benin based on AFLP and microsatellite markers

Marius R. M. Ekué, Oliver Gailing, Barbara Vornam, Reiner Finkeldey
Conservation Genetics**:** DOI 10.1007/s10592-010-0155-z

Abstract 1: Ackee (*Blighia sapida*) is a native multipurpose species important for the livelihoods of the rural populations in Benin. Trees are found in natural forests or are managed by farmers in different traditional agroforestry systems. Genetic variation at amplified fragment length polymorphism (AFLP) markers, four nuclear microsatellites (nSSRs) and one chloroplast microsatellite (cpSSR) were investigated in 279 individuals from six wild and eight cultivated populations from Benin. The AFLP data revealed moderate levels of diversity of ackee in Benin (mean diversity values are proportion of polymorphic loci = 52.8% and Nei's gene diversity = 0.157, for 375 AFLP fragments). The mean diversity values based on nSSR-markers are expected heterozygosity = 0.286, allelic richness = 2.77. Genetic variation of wild and cultivated populations did not differ markedly. AMOVA revealed that only 7.3 and 5.2% of the variation was partitioned among populations for nSSR- and AFLP-markers, respectively. A Mantel test based on these both marker types revealed significant correlations between population pairwise geographic distance and genetic differentiation. Differentiation among cultivated populations was higher than among wild populations. The only polymorphic chloroplast microsatellite marker (ccmp7) showed three haplotypes. Cultivated populations from northeastern Benin were fixed on one haplotype which was not observed elsewhere indicating a different origin of these populations possibly from neighboring Nigeria. Farmer-led domestication had an impact on the spatial distribution of genetic variation but did not result in significant losses of diversity within populations. Measures to conserve genetic resources of ackee in each of the three main bioclimatic zones in Benin are proposed.
Keywords: Blighia sapida, AFLP, Nuclear and chloroplast microsatellites, Genetic structure, Domestication, Human impact, Agroforestry

2. Uses, traditional management, perception of variation and preferences in ackee (*Blighia sapida* K.D. Koenig) fruit traits in Benin: implications for domestication and conservation

Marius RM Ekué, Brice Sinsin, Oscar Eyog-Matig, Reiner Finkeldey
Journal of Ethnobiology and Ethnomedicine 2010, 6:12

Abstract 2: *Blighia sapida* is a woody perennial multipurpose fruit tree species native to the Guinean forests of West Africa. The fleshy arils of the ripened fruits are edible. Seeds and capsules of the fruits are used for soapmaking and all parts of the tree have medicinal properties. Although so far overlooked by researchers in the region, the tree is highly valued by farmers and is an important component of traditional agroforestry systems in Benin. Fresh arils, dried arils and soap are traded in local and regional markets in Benin providing substantial revenues for farmers, especially women. Recently, ackee has emerged as high-priority species for domestication in Benin but information necessary to elaborate a clear domestication strategy is still very sketchy. This study addresses farmers' indigenous knowledge on uses, management and perception of variation of the species among different ethnic groups taking into account also gender differences. 240 randomly selected persons (50% women) belonging to five different ethnic groups, 5 women active in the processing of ackee fruits and 6 traditional healers were surveyed with semi-structured interviews. Information collected refer mainly to the motivation of the respondents to conserve ackee trees in their land, the local uses, the perception of variation, the preference in fruits traits, the management practices to improve the production and regenerate ackee. People have different interests on using ackee, variable knowledge on uses and management practices, and have reported nine differentiation criteria mainly related to the fruits. Ackee phenotypes with preferred fruit traits are perceived by local people to be more abundant in managed in-situ and cultivated stands than in unmanaged wild stands, suggesting that traditional management has initiated a domestication process. As many as 22 diseases have been reported to be healed with ackee. In general, indigenous knowledge about ackee varies among ethnic and gender groups. With the variation observed among ethnic groups and gender groups for indigenous knowledge and preference in fruits traits, a multiple breeding sampling strategy is recommended during germplasm collection and multiplication. This approach will promote sustainable use and conservation of ackee genetic resources.
Keywords: *Blighia sapida*, folk perception, preference, domestication, conservation, Benin

3. Folk perception of sexual dimorphism, sex ratio and spatial repartition: implications for population dynamics of *Sclerocarya birrea* [(A.Rich) Hochst] populations in Benin, West Africa

Gouwakinnou, G.N., Lykke, A.M., Djossa A.B., Sinsin, B.
***Agroforestry Systems*.** DOI 10.1007/s10457-011-9371-x

Abstract 3: In Sub-Saharan Africa indigenous fruit trees play vital roles in nutrition and food security particularly, in food shortage times. Sclerocarya birrea subsp. birrea, an indigenous dioecious fruit tree is such a resource with strong multipurpose use characteristics in semi-arid zones of West Africa. We assessed sex ratio, spatial distribution among male and female adult trees using second order spatial statistics and assessed folk perception of dioecism among the natural populations in protected areas and surrounding agroforestry systems. A field survey showed that 55% of interviewees were aware of sex separation in the species. Some used bark appearance to make distinction between sexes, but this morphological criterion was not consistent with statistical results. The sex ratio did not deviate significantly from 0.5 in any of the districts or land use types. Bivariate spatial analysis with pair correlation function revealed no spatial association between male and female individuals. Moreover, a strict spatial segregation of sexes was not observed even though some individuals of the same sex could sometimes be found together. Results confirmed the functional dioecy of the species and showed that the species did not display any apparent sex specific dimorphism outside the reproduction period or any apparent sex specific requirement for environment conditions.
Keywords: agroforestry, spatial analysis, local perception, dioecious species, spatial segregation of sexes, protected area.

4. Local knowledge, pattern and diversity of use of *Sclerocarya birrea*

Gouwakinnou, G. N., Lykke, A.M, Assogbadjo A. E., and Sinsin B.
Journal of Ethnobiology and Ethnomedicine 2011.*7:8*

Abstract 4: Growing interest is on food tree species in general, and particularly indigenous fruit tree species in developing countries since they are inherent to most tropical landscapes and serve the dual function of local livelihood support and biodiversity conservation. It is therefore relevant to assess the level of integration of these species in local cultures and the factors affecting them. This study aims at assessing knowledge and uses of *Sclerocarya birrea* subsp. *birrea* and factors affecting the use values within and between communities. This study combines quantitative and qualitative ethnobotanical approaches to investigate uses and factors affecting the use value of *S. birrea* subsp. *birrea*. Nine group discussions as well as 161 individual interviews were held in the dry and typical Sudanian zones. Seven different ethnic groups were involved and the survey focused on local uses and perception of factors affecting the dynamics of S. *birrea*. The species has a multitude of uses; all organs are used for more than 20 different purposes. The study highlights how gender, local availability, ethnicity and community location interact to influence the utilization value of the species. People living in drier areas with high occurrence of S*. birrea* use it more than those living in wetter areas with low occurrence. While domestic and subsistence uses do not appear to threaten the species, carving, clearing and drought stand out as the major causes of its decline. Many factors and their interactions influence the pattern of use of the species within and between communities. When compared to the level of exploitation of *S. birrea* subsp. *caffra* in southern Africa*,* the subspecies *birrea* is at this point relatively underutilized. A high commercial potential exists due to its simple propagation ability and makes it an interesting agroforestry resource.
Keywords: Africa, agroforestry systems, ethnobotany, multipurpose species, use value,

5. Phenotypic variations in fruits and potential for multi-criteria selection in *Sclerocarya birrea* [(A.Rich) Hochst] subsp. birrea.

Gouwakinnou, G.N., Assogbadjo, A.E., Lykke, A.M. & Sinsin, B.
Scientia Horticulturae(Under review)

Abstract 5: Domestication of indigenous fruits through agroforestry is seen as one of the important issues in the transformation of land-use in rural areas. A study of variation in fruits traits is important as it is a pre-requisite for cultivar development. We assessed phenotypic variations in fruits and components of *Sclerocarya birrea* subsp. *birrea* indigenous to West Africa semi-arid areas following an aridity gradient. Fruits were collected from 42 trees of various diameters in agroforestry parklands from wet and dry Sudanian climates. They were partitioned into peel, juice/flesh and pit (shell + kernel). Each fruit was labelled and its components were measured and weighted keeping the identity through the series of assessment. The overall mean fruit mass was 18.58 ± 0.24 g (mean ± SE) but fruits from drier zone population were significantly greater (19.90 ± 0.37g vs 17.02 ± 0.24g; $P < 0.001$). Results showed high correlations between fruit and components traits in general ($p < 0.05$). Tree diameter was very weakly correlated with fruits and components traits. There was a high within and between population variation in fruits and components traits. The within population variation represented the most important part (67 to 100%) of the total variation in traits. Selected trees, mainly from the drier zones showed superior agronomical traits. Five groups of trees capable of providing different fruits morphotypes were identified for various prospective exploitations. Results stood as mainstay for preliminaries practical actions towards domestication and conservation of the species in West Africa.
Keywords: Plant selection; Morphological variation; Variance components; Agroforestry systems; Domestication; West Africa.

6. Determinants of intra-ECOWAS trade flows

Afio Zannou
African Journal of Business Management 2010 4(5):678-686.

Abstract 6**:** Through the use of gravity model, this study endeavours to apprehend factors affecting the importance of the Economic Community of West African States (ECOWAS) intra-community trade flows. As expected, it results that remoteness and enclosure reduce the volume of intra-community trade while proximity (geographical, linguistic or monetary) increases it. Also, economic and demographic dynamics are sources of more increased trade within ECOWAS; the same applies to stability of exchange rates and the openness of national economies. However, taking into consideration the heterogeneity of flows through the control over invariable factors in time, only the depreciation of exchange rates and the openness of economies determine the volumes of intra-ECOWAS trade flows.
Keywords: bilateral trade, ECOWAS, gravity model, panel data, currency depreciation, openness, regional integration, West Africa

7. Fungicide effect of banana column juice on tomato southern blight caused by Sclerotium rolfsii: Technical and economic efficiency

Rachidatou Sikirou[1], Afio Zannou[2], Gualbert Gbèhounou[1], Félicien Tosso[3] and Françoise Assogba Komlan[4]
African Journal of Agricultural Research 5(23): 3230-3238.

Abstract 7: The efficiency of banana column juice was compared to that of the synthetic fungicide Maneb 80 and urea in laboratory, in pots under shed and in the field. In laboratory, the products underwent trials conducted on the culture of *Sclerotium rolfsii,* in pots on artificially inoculated plants, and in the field on plants installed in a completely randomized block design with three repetitions on a naturally fungus infected field. The banana column juice, the urea and the Maneb 80 inhibited the growth of the mycelium and the germination of the sclerotia. The analysis of the variance of the Area Under Disease Incidence Progress Curve

(AUIPC) showed a highly significant difference among treatments. In the control of the disease, the benefit of the treatment with banana column juice, Maneb 80 and urea resulted in the reduction of the incidence by 45.5, 31.6 and 38.2% respectively and an increase of the yield of about 27.5, 25.5 and 10.5% respectively. The banana column juice was technically more efficient than Maneb 80 and urea. The banana column juice and the Maneb 80 were economically profitable only during the off-season. The simultaneous application of banana column juice and urea was an amendment harmful to tomato growing.
Keywords: Benin, disease control, biofungicide, *sclerotium rolfsii*, decision matrix, tomato, economic evaluation.

8. Comparative analyses of stakeholders' perceptions of participatory forest management success in Benin

Djogbénou C. P., Glèlè Kakaï R. and Sinsin B.
***International Journal of Biodiversity and Conservation 2010,* 2(12) pp. 395-404.**

Abstract 8: The Participatory Management Designs (PMD) of forest reserves under various ecological, economic and socio-cultural contexts in Benin were assessed using a multicriteria analysis. The three main criteria used for selecting the targeted forests were: (i) natural forest stand, (ii) ongoing participatory management designs and (iii) experience of local people of the forest in its joint management. Using these criteria, the management designs of nine forest reserves were assessed. This was done on the basis of nine secondary criteria whose indicators were submitted for approval by the stakeholders involved in the implementation of the designs. For each criterion, the sampling distribution of the performance scores was empirically established using the language Matlab. This technique helped to estimate the theoretical threshold value beyond which a participatory management design could be considered as successful for each criterion. Results revealed no significant difference in scores between all the criteria considered in the study. However, with the threshold being equal to 60, the forest reserves of Pénéssoulou, Monts-Kouffé and Wari-Maro had the best management designs scores ranging from 88 to 99 considering their overall performance. Two other forest reserves fell in the worse management designs.
Key words: Participatory approach, management design, indicator, performance, forests, Benin.

9. Analyse des perceptions locales des aménagements forestiers participatifs au Bénin

Djogbénou C. P., Glèlè Kakaï R., Arouna O. & Sinsin B.
VertigO, la revue en sciences de l'environnement (In press).

Abstract 9: The present study analyzed the perceptions of forest management by the surrounding populations of the forests reserves under management in Benin according to some criteria like patterns of the forests reserves considered, the sociocultural groups and the educational levels of the populations. The Factorial Correspondence Analysis (FCA) performed on surveyed data related to the perception of 690 informants randomly chosen in 23 surrounding villages of forest reserves helped to analyse the link between various patterns of people and their perceptions. Results revealed that, on the whole, forest management is perceived by the local populations of the forests as a project in activity emphasizing the reforestation, employment for local people and a new manner of managing forest reserves. The local populations of forest reserves managed under projects PAMF and PGRN have perceptions based overall on forest repression (repression of the lack of civic virtue in the forest domain) and more means to forest agents in protecting forest reserves, those which took part in forest management with PRRF Project consider forest management as project in activity and finally the beneficiary populations of UNSO Project consider forest management as a new way to managing forests reserve. By considering the educational levels of people, results showed that the illiterate people have a traditional idea of forest management (reforestation, forest police) whereas those educated have a modern design of forest management (participatory approach of the populations, dialogue). These perceptions are visual and empirical and express the contents of the speeches of sensitization delivered by the projects in charge of the management of forest reserves.
Keywords: Perceptions, forest management, participation, forests reserves, Bénin

10. Analyse comparative des profils des Plans d'Aménagement Participatifs des forêts classées du Bénin

Djogbénou C. P., Arouna O , Toko I. & Sinsin B.
Rev.Sc.Envi.Univ. Lomé *(In press)*

Abstract 10: Profiles (objective, management activities, management units, duration of management support, institutional frameworks) of the participatory management plan experienced in some forest reserves were analyzed using the method of wheel of monitoring assessment. The objectives assigned to forest management vary from one management design to another. The management design in the case of the first category forest reserves of Tchaourou, Toui-Kilibo and Pénéssoulou directed toward the production according their objectives. However, the management design of Pénéssoulou forest reserve could be qualified as more sustainable. the management design (Goungoun, Sota and Goroubi, Agoua, Mounts Kouffé and Wari-Maro forests reserves) could be qualified as integrated forest management design according their objectives. Nevertheless, at the end of the projects which supported these management designs, the continuity of project activities lacked in practice. the objectives of the management designs (Ouémé Supérieur and N'Dali forests reserves) were turned toward conservationResults from the assessment of forest reserves management design indicate the absence of national directives for forest management, but also it highlights project weakness to establish sustainable management of natural resources.
Key words: Profile, management design, forest reserve, Benin.

11. Traditional agroforestry systems and biodiversity conservation in Benin (West Africa)

Vodouhê G.F., Coulibaly O., Biaou G. & Sinsin B.
Agroforestry Systems 2011: DOI 10.1007/s10457-011-9377-4.

Abstract 11: In the past, the conservation of biodiversity has been mostly understood in terms of the management of protected areas and natural forests, ignoring the possible role of farm areas and the ways through which rural communities have promoted biodiversity in their subsistence agricultural production systems. The present study focused on the floristic diversity within traditional agroforestry parkland systems around the Pendjari Biosphere Reserve in Benin and showed the diversity of tree species in the area as well as socio-economic factors which affect the practice of this farming system. We used questionnaires and interviewed a total of 118 households to collect data. Respondents were interviewed on their farms and during the interview; we inventoried the number of tree on the farm and determined the farm size. Twenty-one tree species belonging to fourteen botanical families were recorded during the surveys and the average stand density of the woody component of farmlands was 7.97±5.43 stems/ha. A number of both native and exotic tree species occurred in the parkland agroforestry systems with dominance of indigenous tree species. Species richness varied with the size of household where households with small land holding conserve more tree species in their field than households with large land holdings. 64% of households surveyed were making deliberate efforts to plant tree species on their farmlands. The most important reasons which determined household ambitions to conserve woody species on farmland were tree products contribution to food and medicine. Results also showed that respondents who noticed that trees were decreasing in the wild conserve more tree species on their farmlands. This research highlights the role of traditional agroforestry practices to support tree species richness and provides evidence of the farms' role as biodiversity reservoirs.
Keywords**:** Conservation, indigenous species; parkland agroforestry; socio-economic factors.

12. Community Perception of Biodiversity Conservation within Protected Areas in Benin

Vodouhê G.F. Coulibaly O., Adégbidi A., Sinsin B. 2010.
Forest Policy and Economics 2010: 12 (7): 505-512.

Abstract 12: Commitment of local communities to protected areas is essential for conserving biodiversity. However, in many developing countries like Benin, former management strategies kept human from protected areas using coercion. Fortunately, more recent regimes attempt to give local populations more control on the management but little is known about local residents' perceptions, beliefs and attitudes toward the management of these areas. This study, carried out around the Pendjari National Park, determined factors which support local communities' positive perceptions towards biodiversity conservation in the park, analysed their assessment of current park management activities compared to former management approaches and draw the implications for effective participatory management of protected areas. We collected socio-demographic data from 164 residents on their awareness of conservation methods. We used Stepwise Discriminant Analysis to differentiate the variables that had the greatest power for discriminating between local residents' perception to conserve or not biodiversity and to manage the park. The findings indicated that the positive behavior of local communities towards conservation of biodiversity within Pendjari National Park was highly correlated with the current management strategy that involved more effectively local communities, the educational level of participants and their geographical origins. Participants' perceptions of biodiversity conservation were strongly related to locally perceived benefits. Although 89% of participants were favorable to the concept of biodiversity conservation within the park, the decision to ban encroachments due to agricultural activities increased negative opinion on this park management option. Our results suggested that understanding local residents' perceptions and using them as a starting point to improve the park-people relationship could help park management staff to involve more effectively local communities and improve their awareness about biodiversity conservation within the park.

Keywords: Benin, Biodiversity conservation, Pendjari National Park, local communities, people perception, resource use.

13. *Parkia biglobosa* (Jacq.) R.Br. ex Benth. harvesting as a tool for conservation and source of income for local people in Pendjari Biosphere Reserve

Vodouhê G.F., Adégbidi A., Coulibaly O., Sinsin B.
Acta Botanica Gallica (*In press*).

Abstract 13: In this study, we analyzed the contribution of *Parkia biglobosa* fruit harvesting as source of income for local communities around the Pendjari Biosphere Reserve in Benin and the role that this exploitation plays in improving the conservation status of this species. We interviewed 124 farmers in five villages and conducted field surveys on 80 plots of 50 m * 50 m. Farmers were selected from three pre-established social categories. Results show that *P. biglobosa* contributes to 53% to family net income during its fructification period. Poorer, intermediate as well as wealthier households rely equally on the species. It appears that land unavailability is an important factor which determines household link with species ($F = 26.48$; $p < 0.0001$). Very little evidence could be found indicating that harvesting is damaging the resource. Therefore, for reproducible resources such as *P. biglobosa,* it would be possible to reconcile conservation and poverty reduction objectives.
Keywords*: Parkia biglobosa*; income generation; conservation; Benin.

14. Interactions ticks, hosts and pastures: Case of the Girolando dairy cattle and the artificial pastures of *Panicum maximum* and *Panicum maximum* var. C1.

ZOFFOUN G. A., SALIFOU S., HOUINATO M., SINSIN A. B.
Journal of Agricultural Science and Technology 2011: 5 (3) xx-xx.

Abstract 14**:** On the Kpinnou ranch in Benin, it was observed that the Girolando dairy cattle (imported from Brazil) that graze *Panicum maximum* var. C1 are more susceptible to infestation of ticks, where tendency to abandon the direct grazing of this highly productive forage. The study aims to seek the causes in order to consider the possible solutions to alleviate this scourge. The purpose was to highlight the interactions between ticks and their bovine hosts and two types of artificial grazing pastures. Nineteen young Girolando dairy cattle were used for this study during the big rainy season 2009 (March-June). All present ticks on the animals have been counted by bodily region. The bovine have been distributed then in two relatively homogeneous groups of ten and nine animals while taking into account the age, weight, sex, coat colour, and load in ticks. Group 1 of 10 animals grazed *Panicum maximum*. Group 2 of 9 animals grazed *Panicum maximum* var. C1. Grazing lasted two months. During this period, weekly monitoring of the evolution of the load in ticks is achieved. We have identified four genuses of ticks on the bovine Girolando (*Amblyomma, Hyalomma, Rhipicephalus* and *Boophilus*). The genus *Boophilus* is the most abundant. It was noted that the animals grazed *Panicum maximum* var. C1 are more infested with ticks in this case by the larvae and the nymphs than those that have grazed *Panicum maximum*. A variation of the rate of infestation of the animals was observed in relation to the different bodily regions. The colour of the coat also has an effect on the load in tick of the bovine. The bovine of dark coat are in general more infested than those of clear colour.
Keywords: Ticks, cattle, *Panicum maximum, Panicum maximum var. C1* Kpinnou ranch.

15. Comportement alimentaire des bovins Girolando sur deux types de pâturages artificiels (*Panicum maximum* et *Panicum maximum* var. C1) en zone subéquatoriale

ZOFFOUN G. A., BABATOUNDE S., HOUINATO M., SINSIN A. B.
Canadian Journal of Animal Science *(under review)*

Abstract 15: The eating behavior of the Girolando dairy cattle on the artificial grazing pastures of *Panicum maximum* and *Panicum maximum* var. C1 is studied in the sub equatorial zone of Benin. Sixteen young male cattle are distributed in two groups of eight animals each. The group 1 is fed on *Panicum maximum* and the group 2 on *Panicum maximum* var. C1. The animals are followed with direct observation of the different grazing activities according to bite count method (hand-plucking).The grazing time was significantly ($p < 0.05$) 66.7 %, of the time on *Panicum maximum* the rumination 9.9 %, and the rest 18.1 % . Time proportions gave to *Panicum maximum* var. C1 were as follows: grazing 54.3 %, rumination 12.0 %, rest 28.4 % and watering 5.3 %. The most elevated values of voluntary ingestion are obtained on *Panicum maximum* pasture. On average, the bovine ingested significantly ($p < 0.05$) 109.39 gDM/kg $LW^{0,75}$ per day against 69.67 gDM/kg $LW^{0,75}$ for *Panicum maximum* var. C1 pasture.
Keywords: Cultivated forages, stocking rate, grazing ingestion, ruminant, Benin.

16. Social perception of natural risks by local residents in developing countries—The example of the coastal area of Benin

Oscar Teka & Joachim Vogt
The Social Science Journal 47 (2010) 215–224

Abstract 16: Risk management and planning activities cannot be sustainably and efficiently implemented unless being based on a participative approach resulting from the problem consciousness and perception of the local inhabitants. This requires that the measures linked to problem perception and assessment by local stakeholders, above all by the population affected, are known. This investigation conducted in the flat Beninese coastal lagoon areas aims to assess the local inhabitants' risk perception. The results are the following: (i) the stakeholders have group-specific ways of risk perception (according to ethnicity, social group, age); (ii) every risk management strategy should be based on the group-specific ways of risk perception and assessment; (iii) the acceptance of a given risk management strategy including interactive ways of participation can be advanced through education, dissemination of risk information as well as through communication between stakeholders.
Keywords: Risk perception; Coastal area; Climate change; Participation; Benin

17. Modern issues facing coastal management of the fishery industry: A Study of the effects of globalization in coastal Benin on the Traditional fishery community

Vogt J, Teka O. & Sturm U
Ocean & Coastal Management 53 (2010) 428 - 438

Abstract 17: The high density of population in the coastal region of Benin imposes a considerable pressure upon the fishing grounds and is exacerbated by industrial fishing. Industrial fishing is characterised by more modern and intensive fishing methods and different acting rationalities incompatible with traditional fishing. For traditional coastal fishing societies, this means a non-sustainable intensification of the catch; resulting in declining productivity and living standards, a disorganisation of the traditional societies and increasing socio-economic vulnerability. Many young, traditional coastal fishermen are forced to look for additional sources of income or emigrate to secure their livelihood. The present paper examines the current development of the Beninese coastal fishing with regards to its economic, ecologic and social impacts as a precondition to evolving an adapted fishing management system to develop counter strategies against the marginalisation and expulsion of traditional fishing societies which is currently being observed.
Keywords: Benin, Conflicts, Coastal Fishing, Socio-economic Vulnerability, Acting Rationality

18. Role of community forest reserves in wildlife conservation in Benin, West Africa

Gaston S. AKOUEHOU, Bruno A. DJOSSA, F.C. AHONONGA, B.K. AWESSOU and B. A. SINSIN
International Journal of Biological and Chemical Sciences *2010: 4(4): 1318-1327*

Abstract 18: Sacred groves and community forests are common ways for local rural African people to conserve natural resources. The importance of traditional approach in wildlife conservation was evaluated with line transect method utilized to assess five community forests. Comparable species richness with similar size protected forests of the same regions were reported. However, fauna composition in community forests was dominated by animals that can inhabit anthropogenic habitats like rodents, primates and small antelopes. We concluded the necessity to accompany such local initiatives mainly in regions lacking protected areas in order to give more chance to protect wildlife for present and future generation.
Keywords: Community forest, wildlife, conservation, Benin.

19. Communautés végétales et diversité des chiroptères dans les forêts de Niaouli et de Lokoli au Sud du Bénin

B. A. DJOSSA, A. C. ADOMOU & B. A. SINSIN
International Journal of Biological and Chemical Sciences *2010: 4(6): 2146-2159*

Abstract 19: La présente étude a évalué l'influence du type d'habitats sur la diversité et la structure des communautés des chiroptères dans les forêts de Niaouli et de Lokoli situées au Sud du Bénin. L'inventaire floristique est réalisé avec la méthode de Braun-Blanquet et celui des chiroptères est fait au filet japonais. Ces deux formations forestières ont montré une dissemblance sur le plan floristique avec une dissimilarité de 0,89 et au niveau des communautés de chiroptères qui y sont inféodées avec une dissimilarité de 0,61. Une DCA a aussi montré que les deux formations forestières constituent deux écosystèmes différents de même que les communautés des chiroptères associées. La majorité des espèces de chiroptères recensées dans ces deux forêts sont des espèces dépendantes des forêts denses humides. *Mimetellus moloneyi* (Thomas 1891), *Hipposideros fuliginosus* (Temminck 1853) et *Hipposideros tephrus* (Cabrera 1906) rapportées sont nouvelles pour le Bénin. Les espèces communes aux deux écosystèmes sont caractéristiques des milieux dégradés. La présence des trois nouvelles espèces de chiroptère dans ces forêts de Niaouli et de Lokoli montre qu'elles constituent deux îlots de forêts denses humides dans cette région du pays et doivent être conservés pour les générations actuelles et futures.
Mots clés: Forêt, chiroptère, diversité, structure de communauté, conservation, Bénin.

20. Structure of *Anogeissus leiocarpa* Guill., Perr. Natural stands in relation to anthropogenic pressure within Wari-Maro Forest Reserve in Benin

Achille Ephrem Assogbadjo, Romain Lucas Glele Kakaï, Brice Sinsin and Dieter Pelz
African Journal of Ecology 2010: 48, 644–653

Abstract 20: The present study focused on the analysis of the structure of the Anogeissus leiocarpa dominated natural stands in the Wari-Maro forest reserve which are under high and minimal anthropogenic pressures. These stands were considered for forest inventories after carrying out a random sampling scheme of 40 sample units of 30 m x 50 m. In each level pressure stand, the dbh and tree-height of identified tree species were measured in each plot. Data analyses were based on the computation of structural parameters, establishment of diameter and height distributions and the floristic composition of the two types of stands. Results obtained showed higher values for the overall basal area (9.78m2 ha)1), mean height (22.37 m) and mean diameter (36.92 cm) for A. leiocarpa in low-pressure stands. In high pressure stands, some species like Afzelia africana had lower Importance Value Index and the frequency of A. leiocarpa trees in the successive diameter classes dropped rapidly and the value of the logarithmic slope of the height–diameter relationship was lower (9.77) indicating a lanky shape. Results obtained suggest that effective conservation is needed for A. leiocarpa stands under high pressure by limiting human interference and developing appropriate strategy for restoration purposes.
Keywords: Anogeissus leiocarpa, deforestation, structure, vegetation communities, Wari-Maro

21. Women's Traditional Knowledge, Use Value and the Contribution of Tamarind (*Tamarindus indica* L.) to Rural Households' Cash Income in Benin

Belarmain Fandohan, Achille Ephrem Assogbadjo, Romain Glèlè Kakaï, Tina Kyndt, Emmy De Caluwé, Jean Thimothée Claude Codjia, And Brice Sinsin
Economic Botany, 64(3), 2010, pp. 248–259.

Abstract 21: This study examined differences in knowledge, use values, and contribution of tamarind (*Tamarindus indica*) to women's cash income during the dry season, focusing on seven tribal groups in Benin. Data were gathered using semistructured individual interviews and monitoring, and were analyzed using

quantitative ethnobotanical methods. Principal component analysis was applied to describe the use value and use forms of tamarind according to different tribes. Tamarind was found to play an important role in local communities' livelihoods. Overall, 26 different uses were mentioned for tamarind products. Most commonly, the fruit (pulp) was used to make beverages, as a laxative and purgative, and it seems to be the only plant part sold commercially. Bark was frequently used as a medicine to treat wounds, and leaves were used to make porridge and as an antibiotic. Medicinal, cultural, and material use categories were correlated best with the Fulani, whereas commerce was most correlated with Gourma tribes (PCA analysis). There were significant differences for tamarind utilization among the tribal groups, with overall ethnobotanical use values (EUVT) ranging from 10 to 14, and contribution to cash income ranging from 8.8% to 56.4%. In view of its domestication potential, it is crucial that traditional tribal knowledge of tamarind be preserved and integrated into management policies. Further development and research needs for utilization and conservation are improvement of commercialization, organization of market channels, and extent of genetic diversity within and among populations.
Keywords: Tamarind, underutilized crops, ethnobotany, cash income.

22. Variation in baobab (*Adansonia digitata* L.) leaf morphology and its relation to drought tolerance

A. Cuni Sanchez, N. Haq, A.E. Assogbadjo
Genetic Resources and Crop Evolution (2010) 57:17–25 DOI 10.1007/s10722-009-9447-x

Abstract 22: The baobab tree (*Adansonia digitata* L.) is a valued savannah tree. Although variation in fruit characteristics of this tree have been studied, no studies to our knowledge have been carried out on variation of leaf morphology which can be linked to drought adaptation mechanisms. Accessions of baobab from different ecosystems in Benin were characterized for leaf size and thickness, stomata size and density on the abaxial surface of leaves. Significant variation was found in leaf size and stomata characteristics. Trees from northern study sites had higher stomata density and smaller guard cell length than those from southern study sites. The results show that pruning has a significant effect on leaf size, but not on stomatal characteristics. Trees from northern study sites showed more xerophytic characteristics than those from the south. It seems that genetic and physiological effects may play a role in baobab drought adaptation.
Keywords: *Adansonia digitata*, Drought, Leaf morphology, Stomatal density, Stomatal size

23. Weed removal improves coppice growth of *Daniellia oliveri* and its use as fuelwood in traditional fallows in Benin

R. Houehounha, H. T. Avohou, O.G. Gaoue, A.E. Assogbadjo, B. Sinsin
Agroforestry Systems (2010) 78:115–125 DOI 10.1007/s10457-009-9265-3

Abstract 23: *Daniellia oliveri* is an indigenous tree with multiple coppicing that is harvested as firewood by local people from savannas and traditional fallows in West Africa. We investigated the effects of periodic weed removal on *D. oliveri* resprouting and growth in traditional fallows and its use for firewood production by smallholder harvesters. Protected plots were established in *D. oliveri* dominated fallows at four sites with contrasting soil types. The weedy control plots experienced periodic fires and grass competition. Sizes of firewood logs were surveyed on local markets and used to estimate the quantity of marketable firewood for each treatment. The species sprouted vigorously, forming pure stands. Leading shoot density on weed-free plots was three times higher, reaching 7,250 ± 454 shoots ha-1 34 months after land clearance when compared to 2,425 ± 215 shoots ha-1 on weedy plots. The weed removal treatment increased shoot height from 18 to 34 months after land clearance, while shoot diameter was not affected. After 24 months, 50% of the shoots were of marketable size for the weedy treatment, while this was reached at 18 months for the weed-free treatment.
Keywords: Resprouting, Traditional fallow, Fuelwood, Weed control, Guinea-Sudanian zone, *Daniellia oliveri*, Benin

24. Impact of habitat type on the conservation status of tamarind (*Tamarindus indica* L.) populations in the W National Park of Benin

Adandé Belarmain FANDOHAN, Achille Ephrem ASSOGBADJO, Romain Lucas GLELE KAKAÏ, Brice SINSIN, Patrick VAN DAMME

Fruits, 2010, vol. 65, p. 11–19

Abstract 24: The conservation status of many wild fruit tree species that support rural people in Africa remains poorly documented despite its importance for their management. We compared the viability of tamarind (*Tamarindus indica*) populations, a dry land species that has nutritional, medicinal and cultural importance for rural communities, under different human-pressure levels. The data relative to the tree diameter and height as well as the number of adults and stems were collected in plots of inventory and made it possible to calculate the dendrometric parameters for each targeted population, and to establish their diameter distribution. The dendrometric characteristics were analyzed by using nonparametric tests and the diameter distribution was adjusted to a truncated normal distribution. Numbers of mature tamarind trees per hectare and regeneration (expressed as stem·ha–1) were relatively low, suggesting tamarind populations may not be selfrejuvenating. Nonetheless, significant variation occurred between habitat types ($P < 0.001$). Mature tree density in gallery forests [(18.2 ± 10.1) trees·ha–1] was three to eight times higher than that of savannah woodlands [(5 ± 4.5) trees·ha–1] and farmlands [(2.5 ± 0.4) trees·ha–1]. Young plants followed the same trend, with (11.2 ± 9.3) plants·ha–1, (1.1 ± 0.6) plants·ha–1, and 0.00 plants·ha–1, respectively. Diameter size class distributions departed from normality ($P < 0.0001$) and coefficient of skewness was positive irrespective of habitat type, indicating declining populations. However, median diameter values would suggest the species' populations in farmlands and savannah woodlands to be more vulnerable than those occurring in gallery forests. These findings would suggest that gallery forests best suit tamarind *in situ* conservation. The observed severe reduction of trees and juveniles in farmlands and woodlands may negatively impact the long-term viability of tamarind populations. Juveniles' introduction into farmlands may be needed to ensure conservation in agroforestry systems.

Keywords: Benin, *Tamarindus indica,* resource conservation, habitats, stand characteristics, forest inventories, anthropic influence

25. Variation in seed morphometric traits, germination and early seedling growth performances of *Tamarindus indica* L.

Belarmain FANDOHAN, Achille E. ASSOGBADJO, Romain Glèlè KAKAÏ and Brice SINSIN

International Journal of Biological and Chemical Sciences 2010: 4(4): 1102-1109

Abstract 25: The purpose of this work was to address provenance variation in *Tamarindus indica* seed's morphometric traits, germination and early seedling growth. Seed samples were sampled from three populations in Benin and examined for variations in seed morphometric traits, germination response to pretreatment, and seedling growth. Overall, seed traits significantly differed and showed positive correlation with humidity gradient. The effect of the interaction provenances*pre-treatments was significant on the mean germination time ($p < 0.0001$) but not on the final percentage of germination ($p = 0.937$). Both direct sowing and cow dung solution soaking ensured 90% of germination while boiled water soaking seemed to annihilate the capacity of seeds to germinate. Seeds from the Guineo-Congolian region took fewer days to geminate (13.4) than that from the Sudanian region (20.3). Growth speed also varied, with the Guineo-Congolian provenance reaching 46.1 cm (height) and 0.89 cm (collar diameter) and the Sudanian provenance, 40.4 cm and 0.57 cm respectively, after six month of growth. Results evidence that pre-treatment is not necessarily relevant to reach a high germination percentage for tamarind seeds but may speed germination. The Guineo-Congolian provenance may be preferably used as rootstock onto which further selected cultivars will be grafted and used to rejuvenate traditional agroforestry systems.

Keywords: Seed emergence, seedling growth, early growth speed, Benin.

26. Conservation Genetics of Baobab (*Adansonia digitata* L.) in the Parklands Agroforestry Systems of Benin (West Africa)

Achille Ephrem ASSOGBADJO, Romain GLELE KAKAI, Tina KYNDT, Brice SINSIN
Notulae Botanicae Horti Agrobotanici Cluj-Napoca 38 (2) 2010, Special Issue, 136-140

Abstract 26: The present study occurred in the three climatic zones of Benin (6°25 - 12° N) and aimed at investigating the level of morphometric and genetic variation and spatial genetic structure within and between threatened baobab populations. A total of 137 individuals from six populations were analyzed using morphometric data as well as molecular marker data generated with the AFLP technique. Five primer pairs resulted in a total of 217 scored bands with 78.34% of them being polymorphic. A two-level AMOVA revealed 82.37% of the total variation within populations and 17.63% among populations (P<0.001). Analysis of population structure with allele-frequency based F-statistics revealed a global FST of 0.127±0.072 (P<0.001). The mean gene diversity within populations (Hw) and the average gene diversity among populations (Hb) were estimated at 0.309±0.000 and 0.045±0.072, respectively. Baobabs in the Sudanian and Sudan-Guinean zones of Benin were short and produced the highest yields of pulp, seeds and kernels in contrast to the ones in the Guinean zone. The molecular results indicate some degree of physical isolation of the populations collected in the different climatic zones. We also found morphological differences but further analysis must be done to establish their origin which is certainly an interaction between genotype and environment. Sampling options of the natural populations are suggested for in or ex situ conservation.
Keywords: *Adansonia digitata*, climatic zones, morphometric variation, population structure

27. Effet de l'ombrage du karité sur le rendement capsulaire du coton dans les agroécosystèmes coton-karité du Nord Bénin

D.S.J.C. Gbemavo, R. Glèlè Kakaï, A.E. Assogbadjo, A. Katary2 & P. Gnanglè
TROPICULTURA, 2010, **28**, 4, 193-199

Abstract 27: Influence of the shea butter trees shadiness on cotton culture was studied in shea butter treescotton agroecosystems in four villages of Northern Benin. Three classes of crown diameter of shea butter trees were distinguished after inventory phase and 2 individuals by class of crown diameter were chosen to shelter the experimentation. Circular plot of 7.06 m² were installed under shea butter trees crown at ½r and out shea butter trees crown at 2r (r= crown radius) in the four cardinal directions of each tree sample. In total 192 experimental units were installed in the four sites. Results of analysis of variance, fixed model revealed a very high significant difference of the variables considered (number of plant/m²; number of branches loaded of capsules/plant; number of capsules per plant) between plots under influence and out of the influence of the crown of shea trees (P< 0.001). The average number of plants/m² and the average number of branches laden with cotton bolls per plant were lower under Shea trees (24.07% and 27.26% respectively). The number of cotton bolls per plant decreased by 28.46% on average under the shea tree crown.
Keywords: Ecophysiology- Agroforestry parks- Cotton- Shea butter tree- Benin

28. Quantitative morphological descriptors confirm traditionally classified morphotypes of *Tamarindus indica* L. fruits

Belarmain Fandohan, Achille Ephrem Assogbadjo, Romain Glèlè Kakaï, Tina Kyndt, Brice Sinsin
Genetic Resources and Crop Evolution (2011) 58:299–309. DOI 10.1007/s10722-010-9575-3

Abstract 28: This study used quantitative descriptors to assess morphological variation of traditionally classified tamarind fruits and its relation to ecological conditions. Tamarind trees were sampled spanning locally recognized fruit morphotypes within three ecological zones. Twelve morphological descriptors were measured on 3000 fruits and seeds. Univariate and canonical discrimiant analyses performed on morphological descriptors revealed significant differences and confirmed morphotypes distinction as perceived by local

people. Nevertheless, the variance components analysis showed substantial variations within morphotypes, suggesting a significant heterogeneity within fruits traditionally classified as belonging to the same morphotypes. To get a more powerful morphological discrimination, quantitative descriptors should hence be combined with locally perceived qualitative traits (pulp taste and colour). Observed variations were significantly correlated with ecological factors. Fruits' and seeds' size and mass tended to increase with humidity and decline with aridity. Results also indicated that fruit mass is a good predicator of pulp yield, although its predicting power differed among morphotypes. Outputs from the variance component analysis suggested that pending further genetic studies, germplasm collection should be done by sampling a moderate number of trees per morphotype, to ensure capturing a wide range of genetic diversity. The observed extensive variation has provided with relevant information for further improvement programs.
Keywords: Ecological zones, Folk classification, Morphological variation, *Tamarindus indica*, West Africa

29. Natural variation in fruit characteristics, seed germination and seedling growth of *Adansonia digitata* L. in Benin

A. E. Assogbadjo, R. Glèlè Kakaï, S. Edon, T. Kyndt, B. Sinsin
New Forests (2011) 41:113–125. DOI 10.1007/s11056-010-9214-z

Abstract 29: *Adansonia digitata* (baobab tree), a multipurpose tree species, occurs throughout semi-arid and arid zones of Africa. Its survival is, however, threatened by bush fire, overexploitation, grazing and a lack of natural regeneration. The extent of variation in fruit characteristics, seed germination and seedling traits of the baobab tree in Benin, was evaluated at climatic zone level. 1,200 fruits were sampled in each of the three climatic zones of Benin for morphological assessment and to assess germination rate and seedling growth dynamics according to the climatic zones, the used substrate and the scarification of the seed coat. There were significant differences in fruit characteristics not only between climatic zones but also between individuals from the same zone and within-trees. Using mechanical scarification on freshly-collected baobab seeds negatively affected the germination rate of baobab seeds sampled in the Guinean and Sudano-Guinean zones of Benin. The best-germination rate was recorded for non-treated seeds from the Guinean zone, up to 57% on day 25. All seeds germinated best on the sand substrate, but supplying organic matter promoted further seedling growth after 11 days of germination. Based on these observations we propose some strategies for efficient ex situ conservation of baobab in Benin.
Keywords: Climatic zones, Seed scarification, Germination substrate

30. Effectiveness of a protected areas network in the conservation of *Tamarindus indica* (Leguminosea–Caesalpinioideae) in Benin

Belarmain Fandohan, Achille E. Assogbadjo, Romain L. Glèlè Kaka and Brice Sinsin
African Journal of Ecology 2011, 49, 40–50

Abstract 30: In the absence of effective conservation of its wild relatives, exploitation of a species could lead to genetic depletion. Research on how well do protected areas contribute to the conservation of plant species subject to human exploitation is still limited. The potential niche of *Tamarindus indica* (tamarind) was evaluated and the contribution of the protected areas network (PAN) of Benin to its conservation was assessed. The maximum entropy approach was used to model the ecological niche of the species, and forest inventories were used to address its population structure. To test its effectiveness, the PAN map was overlapped with the habitat suitability map of the species, and its population structures in protected versus unprotected areas were compared. Tamarindus natural populations were confined to the Sudanian and Sudano-Guinean regions. The species populations in the Sudanian region appeared well represented in protected areas in contrast to those in the Sudano-Guinean region. Results showed a positive effect of protected areas on juvenile density but a weak effect on adult density and current size-class distribution. Protection seemed to be unlikely to ensure the long-term persistence of the species. Cryopreservation, assisted recruitment and artificial enrichment of tamarind stands are recommended to ensure the long-term persistence of the species.
Keywords: gap analysis, maximum entropy, multipurpose species, potential niche, population structure

31. Ethnic differences in use value and use patterns of the threatened multipurpose scrambling shrub (*Caesalpinia bonduc* L.) in Benin

Achille Ephrem Assogbadjo, Romain Glèlè Kakaï, François Houtoutou Adjallala, Akomian Fortuné Azihou, Gbèlidji Fifanou Vodouhê, Tina Kyndt , Jean Thimothée Claude Codjia
Journal of Medicinal Plants Research (In press)

Abstract 31: African communities traditionally use medicinal plants for their primary healthcare. To ensure the sustainable use of these species one of the crucial issues is to document African communities' indigenous medicinal knowledge. To achieve this goal, the present study evaluated the use frequency and the knowledge of local Beninese communities on the endangered scrambling shrub (*Caesalpinia bonduc*). Results revealed that local populations use 20 properties from the leaves, roots and seeds of the species to fight against childbirth, to treat burns and for cultural practices like games, weddings and the Fâ ritual. The global credibility level of these properties equalled to 75%, indicating that *C. bonduc* is perceived as very important for local populations. Roots are more intensively used than leaves and seed respectively. The study clearly showed ethnic and age differences in use value and patterns of the species. For example, Kotafon ethnic group had a fair knowledge on the species while Fon and Bariba ethnic groups hold the lowest number of users.
Keywords: Medicinal plant, *Caesalpinia bonduc*, endangered species, endogenous knowledge, use frequency, Benin.

32. Assessment and mitigation of human-lion conflict in West and Central Africa

Hans Bauer, Hans de Iongh & Etotepe Sogbohossou
Mammalia 74 (2010): 363–367

Abstract 32: The lion (Panthera leo) is most threatened in West and Central Africa; livestock encroachment and indiscriminate killing of lions are the main threats. Human-lion conflict mitigation is therefore key to persistence. Several experiments were carried out in the region to assess and mitigate human-lion conflict. In Pendjari National Park in Benin, enclosures of clay instead of the usual thorny branches reduced depredation figures by half. Around the Niger side of 'W' National Park, depredation was estimated at US$138 per household per year and occurred mostly while grazing; people identified improved herding as the most appropriate measure. A livestock corridor through a chain of protected areas has helped reduce conflict in Benoue National Park, Cameroon. Close monitoring and enclosure improvements reduced depredation from 9 to 0 attacks in enclosures and from 60 to 18 on the pastures of six villages around Waza National Park, Cameroon. Cases in Chad and Guinea identified yet other mitigation measures, including the use of dogs, sensitisation over rural radio and using relevant Sourats from the Koran; data on effectiveness are lacking, however. These projects illustrate a varied suite of mitigation options and demonstrate that mitigation can be effective if the method is judiciously chosen and adapted to local circumstances.
Keywords: carnivores; corridor; depredation; enclosures; livestock.

33. Livestock–predator conflict around Pendjari Biosphere Reserve, northern Benin

Etotépé A. Sogbohossou, Hans H. De Iongh, Brice Sinsin, Geert R. De Snoo & Paul J. Funston
Oryx, in press

Abstract 33: Close proximity between humans and large predators results in high levels of conflict. We investigated the extent of, and factors leading to, this conflict through focal groups and individual interviews, coupled with field observations, in all villages around Pendjari Biosphere Reserve, northern Benin. Livestock losses from 2000 to 2007 (n = 752) were reported to be mainly caused by spotted hyaena Crocuta crocuta (53.6%), baboon Papio anubis (24.8%), and lion Panthera leo (18.0%). These predators mainly predated sheep and goats (52.1%) and pigs (42.3%), with lions being the main predator of cattle (78.9%). Lion and hyaena diets were more diverse than baboons, which killed only small stock. The level of conflict increased from 2000 to 2007. Factors that significantly affected predation rate included predator species, month, rainfall of the month

before the predation event, and length of the dry period in a year. The geographical position of the village, the distance of the village to the Park and the number of herbivores legally killed every hunting season also influenced predation intensity. The results of this study may help park managers to apply appropriate mitigation measures to minimize conflict.
Keywords: Benin, Livestock–predator conflict, Pendjari Biosphere Reserve, predation, predator conservation, West Africa

34. Preliminary diagnosis of the nutrient status of cotton (*Gossypium hirsutum* L) in Benin (West Africa)

G. D. Dagbénonbakin, Emile C. Agbangba, R. L. Glèlè Kakaï, H. Goldbach
Bulletin de la Recherche Agronomique du Bénin 2010, 64: 32-45

Abstract 34: Critical leaf nutrient concentrations have often been used to diagnose the nutritional causes of crop under performance. The Diagnosis and Recommendation Integrated System (DRIS), however, provides a reliable means of linking leaf nutrient concentrations to the yield of cotton, and may be developed for this crop using existing experiment data. In the present study, carried out in the Upper Catchment of Benin, fiber yield and leaf nutrient concentration data from an organic and inorganic trials were used to establish Diagnosis and Recommendation Integrated System norms for nitrogen (N), phosphorus (P), potassium K, magnesium (Mg), calcium (Ca), sulphur (S) and zinc (Zn) and statistical parameters for cotton. The Diagnosis and Recommendation Integrated System norms provided by this study were as followings: N/P = 9.65; K/N = 0.59; N/Mg = 10.55; S/N = 0.08; P/K = 0.19; Ca/P = 5.79; Mg/P = 0.96; Zn/P = 0.01; Ca/K = 1.08; Mg/K = 0.18; Zn/K = 0.001; Ca/Mg = 5.77; S/Ca = 0.14; Mg/Zn = 143.84. Although the database was relatively small, the norms derived for nutrient ratios of key biological significance, i.e. N/S and K/N, were within the expected narrow ranges for higher plants, giving credibility to both the database and the Diagnosis and Recommendation Integrated System model. Data from future surveys and field experiments may subsequently be used to enlarge the database allowing the refinement of model parameters and hopefully an expansion of diagnostic scope to include other micro-nutrients. As it stands, this preliminary Diagnosis and Recommendation Integrated System model for cotton is a good diagnostic tool currently available for evaluating the N, P, K, Mg, Ca, S and Zn status for cotton crops in Benin.
Keywords: Preliminary DRIS norms, fiber yield, cotton, Benin.

35. Tests de croissance de jeunes plants de néré (Parkia biglobosa, Jack, R. Br.) en pépinière

P. C. GNANGLE, R. GLELE KAKAÏ, M. OUMOROU, K. N'DJOLOSSE, W. BONOU et N. SOKPON
International Journal of Biological and Chemical Sciences 2010**,** 4(6): 1939-1952.

Résumé 35: Cinq accélérateurs de croissance incluant l'engrais et la période d'application d'extraits aqueux de *Moringa oleifera* ont été testés sur 1288 jeunes plants de 15 provenances de néré (*Parkia biglobosa*) pour évaluer leur croissance morphologique. Les provenances étaient issues de 15 villages échantillonnés dans les 5 parcs à karité-néré du Bénin. L'essai a été conduit en station suivant un dispositif complètement aléatoire à 3 répétitions. Une analyse de variance a été réalisée sur les données morphologiques des plants au 140ème jour après semis et sur l'évolution de ceux-ci dans le temps afin de tester l'effet des provenances et des traitements appliqués. Les résultats obtenus ont révélé que la performance des provenances de néré n'était pas influencée par les conditions climatiques de la zone de prélèvement des semences. En l'absence d'engrais, la provenance P6 (Savè) a donné les meilleurs résultats (6,6 cm de diamètre au collet, 26,3 cm de hauteur totale et 8,5 feuilles au 140ème jour après semis). Avec l'application d'engrais, les provenances P1, P2, P3, P4, P6, P8, P10 et P13 présentent les valeurs les plus élevées des paramètres. L'application d'extraits aqueux de feuilles de *M. oleifera* tous les 10 jours a donné des résultats satisfaisants. Ces résultats suggèrent la considération des arbres-élites dans les tests de provenance de l'espèce.
Mots clés: *Parkia biglobosa* Jack. R. Br, Provenances, accélérateur de croissance, *Moringa oleifera*, croissance morphologique.

36. Drought resistance in an interspecific backcross population of rice (*Oryza spp*.) derived from the cross WAB56-104 (O. sativa)×CG14 (*O. glaberrima*)

Marie Noelle Ndjiondjop, Baboucarr Manneh, Mamadou Cissoko, Nani Khady Drame, Romain Glele Kakai, Roland Bocco, Hugues Baimey, Marco Wopereisa
Plant Sciences 2010, 179: 364–373

Abstract 36: The ability to identify drought-resistant lines in all seasons would accelerate variety introduction. A total of 202 backcross-inbred lines of rice were subjected to drought during the 2006 and 2007 dry seasons at AfricaRice in Benin.Two irrigation regimes were applied: fully irrigated to maturity and 21 days of drought from 45 days after sowing. Plants were harvested at maturity. Increased canopy temperature under drought as compared to fully irrigated condition was observed. Delays were observed in plant flowering and maturity, with drought susceptibility index reaching 26.8 for flowering. Plant leaves were greener (2.9% increase) under drought than when fully irrigated. Drought negatively affected tiller number, plant height, number of leaves, leaf width and grain yield (16.9%, 13.7%, 6.7%, 14.1% and 26.7% respective reductions). Highly significant ($P \leq 0.01$) correlations were observed between traits measured under fully irrigated and drought conditions (r between 0.52 and 0.92), except for leaf greenness (SPAD), leaf width and canopy temperature (r = 0.42 ns, −0.03 ns and −0.30**, respectively). The study identified canopy temperature, SPAD, plant height and leaf number as possible traits that best correlated with grain yield. The performance of these traits under drought was a function of the rice line.
Keywords: Selection; Drought resistance; inbred line; AfricaRice; Irrigation; Upland rice.

37. Potentiel des Ressources Végétales Forestières Alimentaires et Médicinales de la Forêt Classée de l'Ouémé Supérieur et N'Dali au Nord Bénin

C. A. M. Sylvestre Djagoun, Romain Glele Kakaï, Dieu-Donné Konnon, Clément Sewade, Méryas Kouton, Wilfried Bonou, Gérard Gouwakinnou, Belarmain Fandohan
Fruit, Vegetable and Cereal Science and Biotechnology 2010, 4(1): 47-54

Résumé 37 : Le présent travail réalisé dans la forêt classée de l'ouémé supérieur N'dali (OSN) au Nord du Bénin a permis de montrer le potentiel des forêts classées en ressources alimentaires et médicinales en vue d'une meilleur prise en compte dans les plans d'aménagement forestier. La méthode utilisée a consisté à faire des entretiens semi-structurés avec les tradipraticiens et à enquêter les ménages dans les villages riverains de la forêt classée de l'OSN. Enfin, une évaluation de la disponibilité des espèces alimentaires a été faite en installant 277 placeaux de 100 × 100 m² dans les différentes formations végétales de la forêt soit un taux d'échantillonnage de 0.16%. Les résultats d'enquêtes montrent que les espèces de la forêt classée de l'OSN servent plus à des fins médicinales qu'alimentaire. Les racines sont plus récoltées que les écorces, suivies des feuilles pour des utilisations médicinales. Les espèces prioritaires enregistrées pour l'alimentation sont *Blighia sapida*, *Vitellaria paradoxa*, *Tamarindus indica*, *Parkia biglobosa*, *Adansonia digitata*, *Spondias mombin*. Les espèces alimentaires localement plantées ou épargnées dans les champs autour de la forêt classée de l'OSN sont essentiellement: *B. sapida*, *V. paradoxa*, *S. mombim*, *P. biglobosa.* La disponibilité des espèces d'importance comme *Khaya senegalensis* (0.80 tige/ha), *P. biglobosa* (5.71 tiges/ha), *T. indica* (0.21 tige/ha) et *S. mombin* (0.02 tige/ha) est relativement faible dans la forêt classée de l'OSN. Les ressources forestières alimentaires ont une grande importance pour les populations rurales. Ce qui ouvre la voie à des programmes de mise en valeur de ces produits.
Mots-clés : plan aménagement, produits forestiers non ligneux, valorisation.

38. Asymptotic Error Rate of Linear, Quadratic and Logistic Rules in Multi-Group Discriminant Analysis

R. Glèlè Kakaï[1], D. R. Pelz[2]
International journal of applied mathematics and statistics *2010,* 18(10): 69-81

Abstract 38: A Monte Carlo study was performed to assess the asymptotic error rate of linear, quadratic and logistic rules in 2, 3 and 5-group discriminant analyses. The simulation design that was considered took into account the overlap of the populations (*e*=0.05, *e*=0.1, *e*=0.15), their common distribution (Normal, Chi-square with 12, 8, and 4 df) and their heteroscedasticity degree, Γ, measured by the value of the power function, 1-β of the homoscedasticity test related to Γ (1-β =0.05, 1-β =0.4, 1-β =0.6, 1-β =0.8). For each combination of these factors, the asymptotic error rate of the 3 rules was computed using large samples of size 20,000. The efficiency parameter of the rules was their relative error, *re* with regard to the optimal error rate. The results showed the overall best performance of the quadratic rule for Normal heteroscedastic cases. For Normal homoscedastic populations, the three rules have the same efficiency. The linear rule seemed to be more robust to an increased number of groups than the two other rules. The logistic rule was less affected by the distribution of the populations. Moreover high overlap favored linear and quadratic rules. The logistic rule seemed less influenced by the overlap of the populations. For small size samples, the three rules become less efficient.
Keywords: Monte Carlo experiment; Multi-group discrimination; Asymptotic error rate.

39. On the efficiency of the linear classification rule in multi-group discriminant analysis

R. L. Glele Kakaï D. R. Pelz and R. Palm
African Journal of Mathematics and Computer Science Research 2010: 3(1): 19-25

Abstract 39: A Monte Carlo study was performed to assess the relative efficiency of the linear classification rule in 2, 3 and 5-group discriminant analysis. The simulation design took into account the number p of variables (4, 6, 10, 18), the size sample n so that: n/p = 1.5, 2.5 and 5. Three values of the overlap, *e* of the populations were considered (0.05; 0.1 ; 0.15) and their common distribution was Normal, Chi-square with 12, 8, and 4 df; the heteroscedasticity degree, Γ was measured by the value of the power function of the homoscedasticity test related to Γ (0.05 ; 0.4 ; 0.6 ; 0.8). For each combination of these factors, the actual empirically computed error rate was used to calculate the relative error, *re* of the rule. The results showed that for normal or homoscedastic populations, the efficiency of the rule became better for large number of groups. Non-normality or heteroscedasticity negatively impacted the performance of the rule whereas high values of the ratio *n*/*p* and high overlap have positive effect on the rule. The Mean Relative Error of the rule became three times more important from homoscedastic to heteroscedasticity.
Keywords: error rate; data samples; linear rule; multi-group; simulation.

40. Disturbance and population structure of *Vitex doniana* Sw. in northern Benin, West Africa

Madjidou OUMOROU, Théophile SINADOUWIROU, Martial KIKI, Romain GLELE KAKAÏ , Guy Appolinaire MENSAH and Brice SINSIN
International journal of biological and chemical sciences *2010,* 4(3): 624-632

Abstract 40**:** *Vitex doniana* Sw. (black plum) is a species known to have socio-economic potentialities due to its food, therapeutic and cultural uses. The structure and natural regeneration of this species were studied in Banikoara district, in northern Benin. The main objective was to develop strategies for conservation and sustainable use of this species. Collected data focused on diameter, height, number of individuals and regenerations in plots of various sizes according to habitats considered. Degree of threat and the endogenous uses and methods of conservation were also assessed. The results showed that *V. doniana* presented, in general, an aggregative distribution (Blackman Index = 10.84) which was related to its dissemination type and a random distribution in agroforestry parklands (Blackman Index = 0.34) related to management type. The

density values of mature and natural regeneration were low. The species suckered well in all habitats and have a relatively stable structure in natural areas. However, *V. doniana* presented a degree of threat respectively equivalent to 62.27% and 95.65% in disturbed riparian landscape and in parklands. The various uses showed that fruits and leaves were the most used parts in feeding and in traditional medicine. They are sold in local markets and are not subject to industrial processing.
Keywords: Structure, regeneration, black plum, conservation, Banikoara, Benin.

41. Comparaison du Système Intégré de Diagnostic et de Recommandation et de la Méthode de la Valeur Critique pour la détermination du statut nutritionnel de l'ananas (*Ananas comosus* (L.) Merr) variété Cayenne lisse au Bénin

Gustave D. DAGBENONBAKIN, Emile Cossi AGBANGBA et Valentin KINDOMIHOU
International journal of biological and chemical sciences *2010,* 4(5): 1550-1563

Résumé 41 **:** Le Système Intégré de Diagnostic et de Recommandation (DRIS), et la Méthode de la Valeur Critique (CVM) ont été utilisés pour évaluer le statut nutritionnel de la variété ''Cayenne lisse'' d'ananas (*Ananas comosus (L.)* Merr) sur un sol ferralitique faiblement désaturé dans la Commune d'Allada, située dans le Département de l'Atlantique au Sud-Bénin. L'étude vise à: comparer DRIS et la CVM, établir les normes DRIS pour cette variété d'ananas et en évaluer les pratiques actuelles de fertilisation. La population de rendement a été subdivisée en sous-population de rendements élevés (> 87,9 t.ha-1) d'effectif 24 et sous-population de rendements faibles (< 87,9 t.ha-1) de taille 36 en utilisant la moyenne additionnée à l'intervalle de confiance comme séparateurs de rendements. Les résultats d'analyses foliaires ont été comparés aux normes préexistantes pour les deux méthodes. Les résultats montrent que les deux méthodes permettent de faire des diagnostics fiables pour le S, Mg, Ca et Zn pour cette variété d'ananas. Cependant, alors que le DRIS décèle avec fiabilité un excès de N et K sur la "Cayenne lisse", la CVM détecte une déficience en N et K. Par conséquent, la méthode DRIS accroît la précision dans le diagnostic par rapport à la CVM..
Mots clés **:** CVM, DRIS, indice de nutriments

42. Establishment of standards of Diagnosis and Recommendation Integrated System (DRIS) of pineapple culture (*Ananas comosus (L.) Merr*) Sugar loaf variety in subequatorial zone of Benin

AGBANGBA Cossi Emile, DAGBENONBAKIN D. Gustave et KINDOMIHOU Valentin
Annales de l'Université de Parakou, Série Sciences Naturelles et Agronomie *2010***,** 1: 51-69

Abstract 42**:** The Diagnosis and Recommendation Integrated System (DRIS) provides a means of simultaneously identifying imbalances, deficiencies and excesses in crop nutrients, and ranking them in order of importance. Some proponents of DRIS claim it able to establish nutrient standards regardless of varietal or geographic variables or both. This study concerns the use of DRIS approach to assess pineapple (*Ananas comosus (L.) Merr*) nutrient requirements of the variety Perola on ferrallitic soils in the Allada District, located in the coastal hinterland of Benin. The aim of this study is to: (1) evaluate pineapple nutrient status in the Commune of Allada; (2) compare the DRIS method with the critical value method (CVM) for foliar nutrients diagnosis of "Perola" variety; (3) develop DRIS norms for "Perola" pineapple variety; (4) evaluate the current fertilization practices on the nutritional status for that variety. To achieve this goal, sixty (60) plots of 16m² (4m x 4m) have been established in 60 farmers' pineapple fields, at the rate of 15 per districts. In each field a representative plot of 16 m2 (4 m x 4 m) was established and 10 "D" leaves samples were taken at flowering stage in each plot. DRIS standards for pineapple were developed from 60 observations of nutrient composition. DRIS and CVM methods were able to correctly diagnose N, S and Mg for variety "Perola". However, Critical Value Method failed to make a correct diagnosis for P, K, Ca, and Zn for the pineapple variety "Perola". When DRIS revealed excess for Zn and deficiencies for K and Ca in variety "Perola", CVM indicated respectively adequation of Zn, K and Ca. As conclusion, superior precision is obtained with DRIS approach compared to CVM.
Key words: Benin, CVM, DRIS, nutrient indices, Pineapple.

43. Effect of Moisture Stress on Leaf Silicification of Three Tropical Fodder Grass Species (*Pennisetum purpureum, Panicum maximum* Cv. C1 and *P. maximum* Jacq.) In Republic of Benin (West Africa)

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Abstract 43: Silica accumulation in plants was found to be influenced by environmental factors and growth conditions. But, the processes and patterns were reported to be extremely complex. To examine whether inter-specific variations in silica concentration and other traits and relationships exist in response to moisture stress, we created different moisture levels in 3 tropical fodder grass species (*Pennisetum purpureum*, *Panicum maximum* cv. C1 and *P. maximum* Jacq.) by watering pots every 3 days (moisture-stressed) or every day (control), from January 4 to March 15, 2002. Leaf biomass of all species was decreased in response to moisture stress and leaves were yellow and wilted. A lower leaf biomass under moisture stress was associated with blades of higher specific leaf area and water content and lower silica concentration in *P. purpureum* but not in the *Panicum* accessions. Silica concentration ranged from 2.03% to 5.2% in blades and from 1.95% to 3.4% in sheaths. *P. maximum* C1 had the lowest values, while *P. purpureum* showed the highest values. Increased silica deposition in well watered plants may result from higher transpiration rates. Silica was highly correlated with soluble ash in both species.
Key words: Water stress, Grass, Silica, Specific leaf area, Relative water content, Carbon, Soluble ashes

44. Farmers' perception and response to soil erosion while abiotic factors are the driving forces in Sudanian drier zone of Benin

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Abstract 44: Sudanian drier zone is characterized by a natural phenomenon of soil collapse called "Donga". The main objective of this study is to contribute to a better understanding of the Donga process as perceived by the bordering population of the W National Park of Benin. Local people that belong to the main ethnic group were interviewed in surrounding villages in order to assess how far they pointed out causes and factors determining soil erosion and land degradation in the W National Park and in land use areas, using structured and semi-structured interviews. The results showed that the main causes of erosion and soil degradation according to the local population are deforestation (75% of respondents) and the farmers' settlement on farms (88.9% of respondents). The main factors they noticed were slope, run-off and gap in land cover and inadequate land use practices for agriculture. The perception of different ethnic groups of erosion and soil degradation causes was in general the same. Concerning the erosion and soil degradation factors, we observed a well-structured perception according to the ethnic groups. Old Hausa and Adult Fulani often cited the soil type as the factors that determine soil degradation whereas Young Gourmantché and young Hausa pointed out the run-off and the slope. The main adaptation strategies developed by locals were orthogonal cultivation (73.5 %) crop rotation (62.5 %) and bottom slope cultivation (50.7 %).
Keywords: Gully erosion, donga, land use area, protected area, causes, Benin.