



Changement climatique : analyse des publications 2013-2014 du Cirad

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Changement climatique : analyse des publications 2013-2014 du Cirad

Résumé

Une analyse des publications du Cirad a été menée à partir de la base de données institutionnelle Agritrop pour : 1) identifier les publications 2013-2014 du Cirad sur le changement climatique ; 2) mesurer l'importance relative du thème « changement climatique » dans les publications du Cirad ; 3) identifier les départements, les unités de recherche et les chercheurs du Cirad qui ont publié sur le sujet ; 4) repérer les principales zones géographiques ainsi que les sujets principaux ou émergents en lien avec le changement climatique traités dans les publications du Cirad.

Le corpus sélectionné pour l'étude est composé de 266 références de publications réparties entre articles de revues (202), ouvrages (15), chapitres d'ouvrages (38), actes de congrès (2), thèses (6) et mémoires HDR (3). Le corpus d'étude représente 11,5 % des publications 2013-2014 du Cirad. Le département Environnement & Sociétés (ES) est le département du Cirad dont les chercheurs ont le plus publié sur le changement climatique (157 publications). Biens et Services des Ecosystèmes Forestiers tropicaux (BSEF) est au premier rang des unités de recherche du Cirad dont les chercheurs publient sur le sujet (51 publications). 200 publications soit 75% du corpus sont en langue anglaise. L'Afrique est le continent qui fait le plus l'objet des publications du Cirad sur le changement climatique. Le Cameroun et Madagascar pour l'Afrique ainsi que le Brésil, la Guyane française et le Costa Rica sont les pays ou territoires les plus traités. La climatologie et la conservation des ressources naturelles sont les catégories de la classification Agris/Caris de la FAO les plus représentées dans le corpus.

Une analyse par VOSViewer des co-occurrences de termes dans les titres et résumés des seules publications en langue anglaise dessine cinq sous-ensembles : la forêt et la biomasse ; les facteurs du milieu, les mesures et les observations ; la biodiversité, les services écosystémiques et la déforestation ; les maladies, les vecteurs, leurs hôtes, et la sélection ; la politique, les acteurs et la société.

L'examen notice par notice du corpus entier fait apparaître cinq grands objets de recherche au Cirad en lien avec le changement climatique : l'économie, le développement et la sociologie ; les ressources naturelles et l'environnement ; les productions forestières et la conservation des ressources forestières ; les productions végétales ; les productions animales et la santé animale.

Mots-clés : changement climatique, publications, CIRAD, Agritrop

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1. Objectif de l'étude et constitution du corpus

1.1. Objectif de l'étude

Cette étude bibliographique a pour objectifs :

- identifier les publications 2013-2014 du Cirad sur le changement climatique ;
- mesurer l'importance relative du thème « changement climatique » dans les publications du Cirad ;
- identifier les départements, les unités de recherche et les chercheurs du Cirad qui ont publié sur le sujet ;
- repérer les principales zones géographiques ainsi que les sujets principaux ou émergents en lien avec le changement climatique traités dans les publications du Cirad.

1.2. Constitution du corpus

Les notices bibliographiques ont été extraites le 5 février 2015 d'Agritrop, base de données des publications du Cirad.

Les publications du Cirad sélectionnées sont : les articles de revues, les ouvrages et chapitres d'ouvrage, les actes de congrès, les thèses et les mémoires d'HDR, publiées en 2013 ou 2014, et enregistrées dans Agritrop avant le 6 février 2015.

Dans un premier temps, une sélection très large a été réalisée à partir des mots des notices :

- sur le changement climatique comme thème principal de la publication ;
- sur le climat ou à la météorologie (précipitation, température, conditions climatiques, variation saisonnière, sécheresse, froid, zone climatique et agro climatique, vent, catastrophe naturelle, etc.) ;
- sur la séquestration du carbone, le cycle du carbone, les gaz à effet de serre, etc.
- sur les services environnementaux et écosystémiques, sur les politiques environnementales associées, etc.

338 références ont été extraites. De cette extraction, 266 références pertinentes ont été sélectionnées qui constituent le corpus de la présente étude.

Le corpus est constitué des types (et nombre) de documents suivants :

actes de congrès (2)

ouvrages (15)

chapitres d'ouvrage (38)

HDR (3)

thèses (6)

articles de revues (202), dont :

- articles publiés dans une revue à facteur d'impact (155)
- articles publiés dans une revue à comité de lecture, sans facteur d'impact (36)
- articles publiés dans une revue sans comité de lecture (7)
- autres articles (4)

200 (75 %) des publications sont en anglais, 54 en français, 8 en espagnol, 3 en portugais, 1 en vietnamien.

1.3. Importance relative du thème « changement climatique » dans Agritrop

Le corpus initial extrait d'Agritrop très large (338 références) représente 14,7 % des 2 303 publications du Cirad de mêmes types. Le corpus sélectionné (266 références) représente 11,5 % des publications du Cirad. Cette part relative du sujet « Changement climatique » évolue avec le temps en fonction des publications référencées dans Agritrop.

2. Les départements et les unités de recherche et les auteurs Cirad

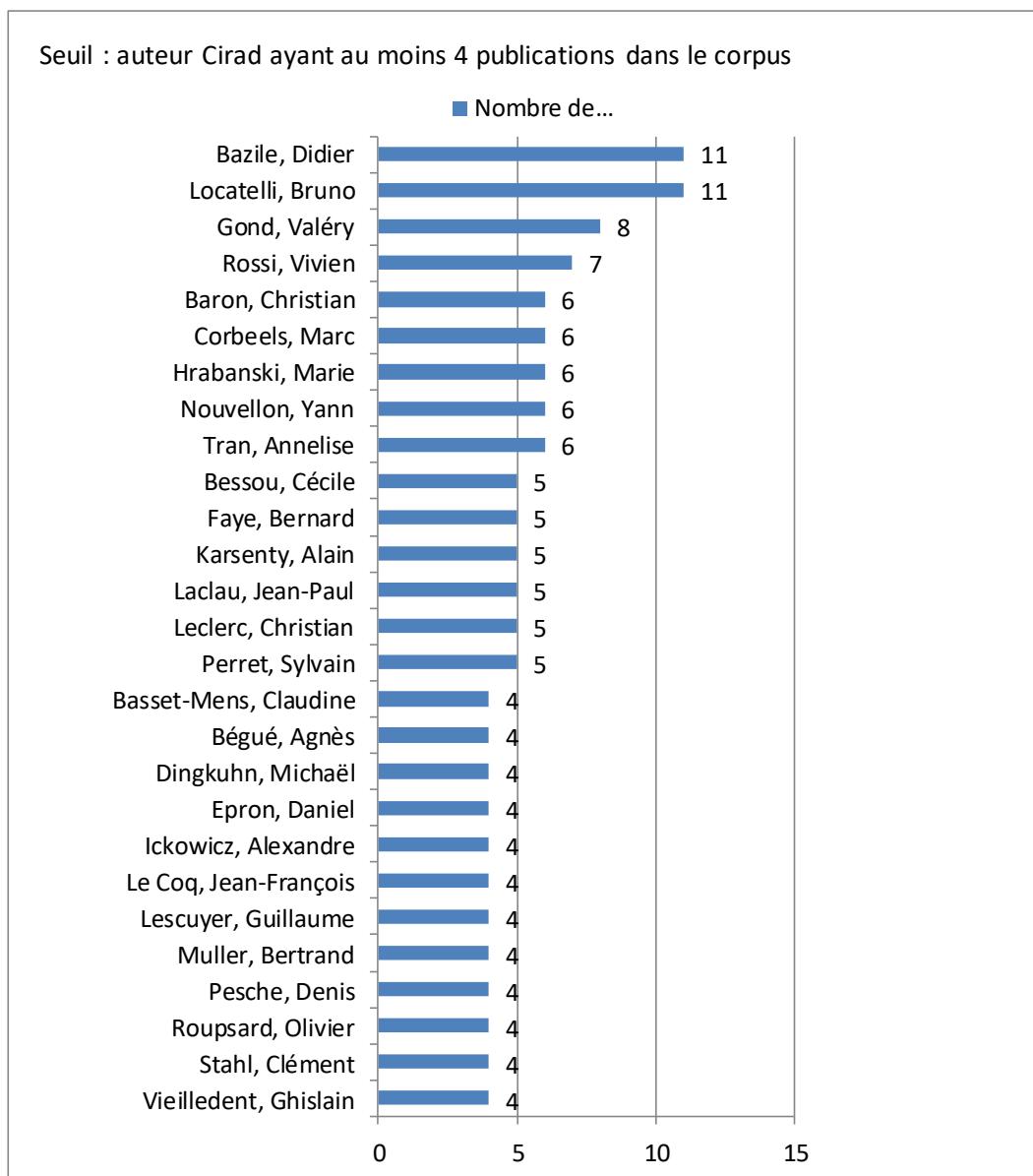
La répartition des 266 références par affiliation (adresse de l'auteur dans la notice) est la suivante :

Tableau 1 : Répartition des publications par département des auteurs Cirad

Nombre de publications	Nom du département et de l'unité de recherche
12	DG et DGDRS
66	BIOS
157	ES
81	PERSYST

Tableau 2 : Répartition des publications par unité de recherche des auteurs Cirad

Nombre de publications	Nom du département et de l'unité de recherche
12	DG&DGDRS
43	BIOS-UMR AGAP
5	BIOS-UMR AMAP
2	BIOS-UMR CBGP
2	BIOS-UMR CEFÉ
10	BIOS-UMR CMAEE
1	BIOS-UMR INTERTRYP
1	BIOS-UMR PVBMT
1	BIOS-UMR RPB
3	BIOS-UPR BIOAGRESSEURS
15	ES-UMR ART-DEV
4	ES-UMR CIRED
11	ES-UMR ECOFOG
13	ES-UMR G-EAU
8	ES-UMR INNOVATION
2	ES-UMR MOISA
23	ES-UMR SELMET
17	ES-UMR TETIS
12	ES-UPR AGIRS
51	ES-UPR BSEF
21	ES-UPR GREEN
24	PERSYST-UMR ECO&SOLS
1	PERSYST-UMR QUALISUD
8	PERSYST-UMR SYSTEM
11	PERSYST-UPR AIDA
1	PERSYST-UPR BioWooEB
10	PERSYST-UPR HORTSYS
17	PERSYST-UPR SCA
5	PERSYST-UPR SIA
6	PERSYST-UPR SYSTEMES BANANES ET ANANAS
9	PERSYST-UPR SYSTEMES DE PERENNES

Figure 1 : Les principaux auteurs Cirad

3. Les zones géographiques

La zone géographique retenue est celle du champ descripteur matière géographique des notices bibliographiques. Elle est relative à l'objet de recherche de la publication et non à l'affectation géographique des auteurs. Les descripteurs sont extraits du thésaurus Agrovoc de la FAO.

Une même publication peut être comptabilisée dans aucune, une ou plusieurs zones géographiques. En fin de document, l'index des descripteurs géographiques détaille pour chaque zone géographique, le nombre de publications et le numéro des publications dans la bibliographie.

3.1. Répartition par grandes zones géographiques Agrovoc

Pour ce regroupement, il s'agit de la géographie physique et non de la géographie politique. Par exemple, les publications relatives à la Guyane française sont comptabilisées dans la zone « Amériques ».

Figure 2 : Répartition des publications par grandes zones géographiques

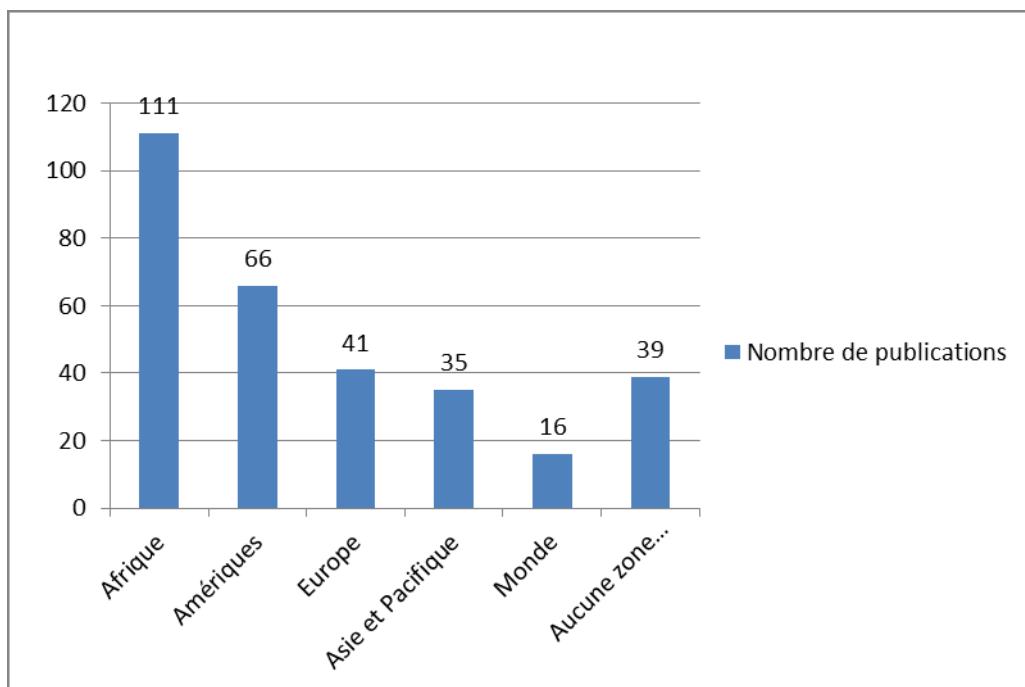


Figure 3 : Descripteurs géographiques Agrovoc les plus fréquents



3.2. Répartition des 110 publications relatives à l'Afrique

Tableau 3 : Afrique - Répartition des publications par descripteur géographique Agrovoc

Nombre de publications	Descripteur géographique Agrovoc
18	CAMEROUN
14	AFRIQUE
14	MADAGASCAR
14	SAHEL
12	AFRIQUE CENTRALE
8	AFRIQUE AU SUD DU SAHARA
8	CONGO
8	MALI
8	REPUBLIQUE DEMOCRATIQUE DU CONGO
8	SENEGAL
7	AFRIQUE OCCIDENTALE
7	KENYA
6	GABON
5	BENIN
5	BURKINA FASO
5	NIGER
5	REUNION
5	TCHAD
4	FLEUVE CONGO
4	LAC TCHAD
3	BURUNDI
3	REPUBLIQUE CENTRAFRICAINE
3	RWANDA
2	AFRIQUE ORIENTALE
2	EGYPTE
2	GUINEE EQUATORIALE
2	NIGERIA
2	OUGANDA
2	REPUBLIQUE-UNIE DE TANZANIE
2	SAO TOME-ET-PRINCIPE
2	SOUDAN
2	TUNISIE
1	AFRIQUE DU NORD
1	AFRIQUE DU SUD
1	COMORES
1	COTE D'IVOIRE
1	ETHIOPIE
1	GOLFE DE GUINEE
1	MAYOTTE
1	MOZAMBIQUE
1	TOGO
1	ZIMBABWE
1	ZONE SOUDANO-SAHELIENNE

3.3. Répartition des 66 publications relatives aux Amériques

Tableau 4 : Amériques - Répartition des publications par descripteur géographique Agrovoc

Nombre de publications	Descripteur géographique Agrovoc
20	BRESIL
11	COSTA RICA
11	FRANCE-GUYANE FRANCAISE
9	AMAZONIE
6	REGION ANDINE
5	AMERIQUE DU SUD
4	AMERIQUE CENTRALE
3	COLOMBIE
3	PANAMA
2	AMERIQUES
2	ARGENTINE
2	BRESIL-MATO GROSSO
2	BRESIL-SAO PAULO
2	EQUATEUR
2	GUATEMALA
2	HONDURAS
2	NICARAGUA
2	PEROU
2	URUGUAY
1	AMAZONE
1	BRESIL-PARA
1	BRESIL-PARANA
1	CHILI
1	COTE D'IVOIRE
1	FRANCE-MARTINIQUE
1	GABON
1	MEXIQUE
1	PORTO RICO
1	USA-IOWA

3.4. Répartition des 35 publications relatives à l'Asie ou au Pacifique

Tableau 5 : Asie ou Pacifique - Répartition des publications par descripteur géographique Agrovoc

Nombre de publications	Descripteur géographique Agrovoc
7	THAILANDE
6	INDONESIE
5	VIET NAM
3	ASIE DU SUD-EST
3	PHILIPPINES
2	CHINE
2	MALAISIE
2	ASIE
2	SUMATRA
2	AUSTRALIE
1	NOUVELLE-CALEDONIE
1	OCEAN INDIEN
1	OCEANIE
1	ILES DU PACIFIQUE (TERRITOIRE SOUS TUTELLE)
1	REPUBLIQUE DEMOCRATIQUE POPULAIRE LAO
1	ASIE ET PACIFIQUE
1	CAMBODGE
1	PAPOUASIE-NOUVELLE-GUINEE

3.5. Répartition des 41 publications relatives à l'Europe

Tableau 6 : Europe - Répartition des publications par descripteur géographique Agrovoc

Nombre de publications	Descripteur géographique Agrovoc
15	FRANCE
2	FRANCE-PROVENCE-ALPES-COTE D'AZUR
1	FRANCE-CORSE
1	FRANCE-ILE DE FRANCE
1	FRANCE-LANGUEDOC-ROUSSILLON
1	FRANCE-LORRAINE
1	FRANCE-MOSELLE
1	FRANCE-NORD-PAS DE CALAIS
1	FRANCE-PICARDIE
7	REGION MEDITERRANEENNE
6	EUROPE
2	EUROPE DU SUD
2	ITALIE
1	ESPAGNE
1	ROYAUME-UNI
1	ALPES
1	PORTUGAL
1	PAYS DE L'UNION EUROPEENNE

4. Co-occurrences des termes dans les titre et résumé en anglais

4.1. Méthodologie

Une analyse des occurrences des termes des titre et résumé des 200 références en anglais composant le corpus a été menée avec le logiciel VOSViewer (www.vosviewer.com/) de l'université de Leiden (Pays-Bas).

Pour cette analyse, les critères suivants ont été appliqués :

- seule la présence (et non le nombre d'occurrences) d'un terme dans le titre ou le résumé d'une référence est comptabilisée.
- les mots vides (introduction, conclusion, scope, aim, ...) ont été retirés ;
- sur les 7 353 termes identifiés par VoSViewer, 276 termes ont été retenus après application du seuil de **5 occurrences** d'un terme dans l'ensemble des références ;
- sur les 276 termes retenus, **166 termes** ont été sélectionnés sur la base de leur score de pertinence calculé par VOSViewer.

4.2. Résultats

La carte affiche sous la forme de libellés et d'encadrés en couleur, les termes sélectionnés selon leur occurrence et leur pertinence :

- plus les termes sont volumineux, plus ils sont fréquents et pertinents dans le corpus d'étude ;
- plus les termes sont proches, plus leur co-occurrence est élevée ;
- les couleurs des termes représentent autant de groupes de termes fortement liés entre eux.

5 groupes de points se distinguent par leurs couleurs portant respectivement sur : 1) **la forêt et la biomasse** ; 2) les **facteurs du milieu, les mesures et les observations** ; 3) **la biodiversité, les services écosystémiques et la déforestation** ; 4) **les maladies, les vecteurs, leurs hôtes, et la sélection** ; 4) **la politique, les acteurs et la société**.

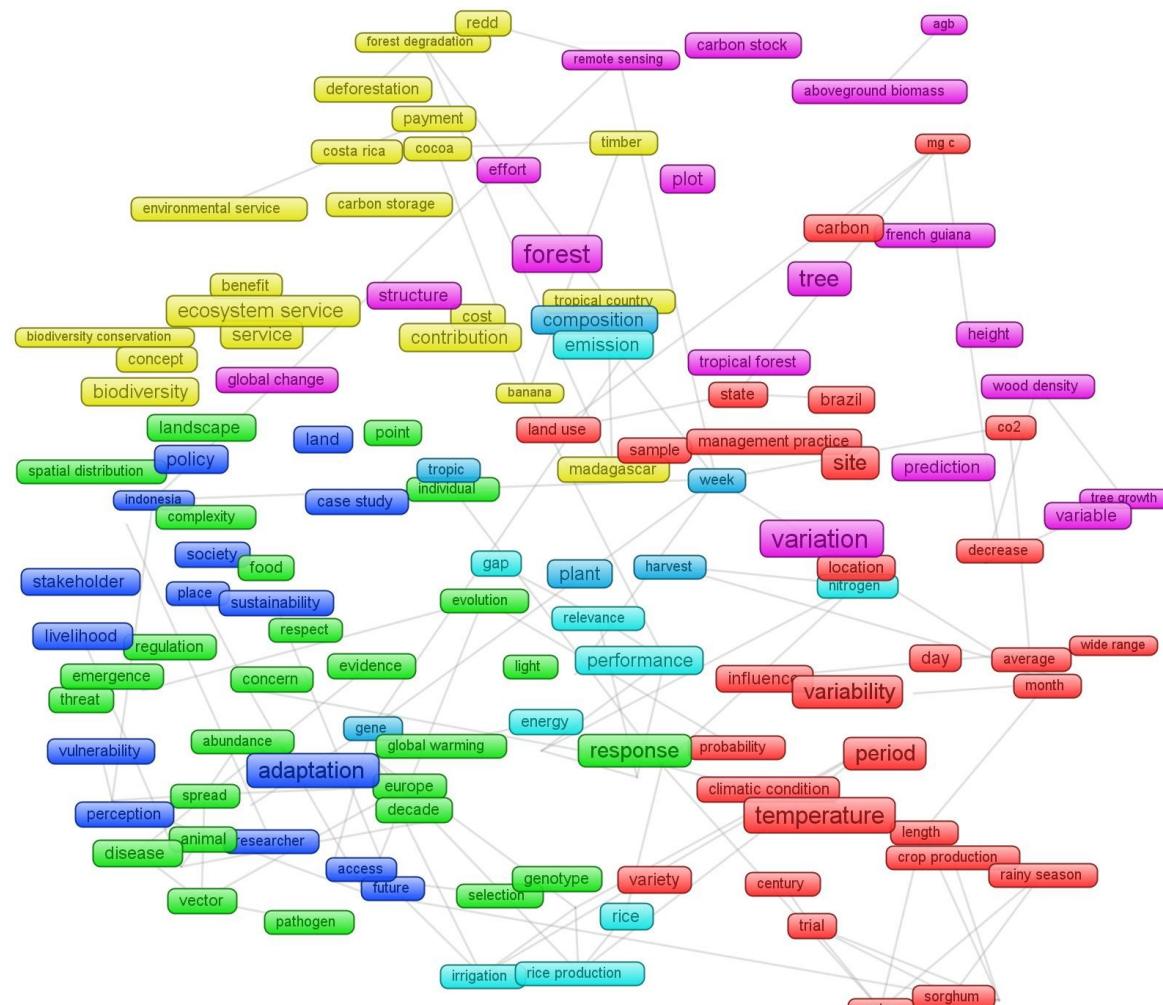
1) Le groupe rose de termes est relatif à la **forêt**, aux **arbres**, au **bois**, au **stock de carbone**, à la **biomasse**, à la variation. La **Guyane française** y est rattachée ;

2) Le groupe rouge de termes concerne les **facteurs du milieu**, les **mesures** et les **observations** : température, saison, site, variation, variabilité, index foliaire. Il inclut le **sorgho**, le **maïs** et le **coton**.

3) Un groupe jaune de termes se rapporte à la **biodiversité**, à la **conservation**, aux **services écosystémiques** ou **environnementaux**, le **stockage du carbone**, à la **déforestation** et la **dégradation**. Le **cacaoyer** et le **bananier** y sont rattachés.

4) Un groupe vert de termes inclut **maladie**, **pathogène**, **vecteur**, **animal**, **menace**, **génotype**, **sélection**.

5) Un groupe bleu tendant à se confondre avec le groupe vert et englobant les termes d'**adaptation**, de **vulnérabilité**, de **société**, d'**acteur**, de **perception**, de **politique**.



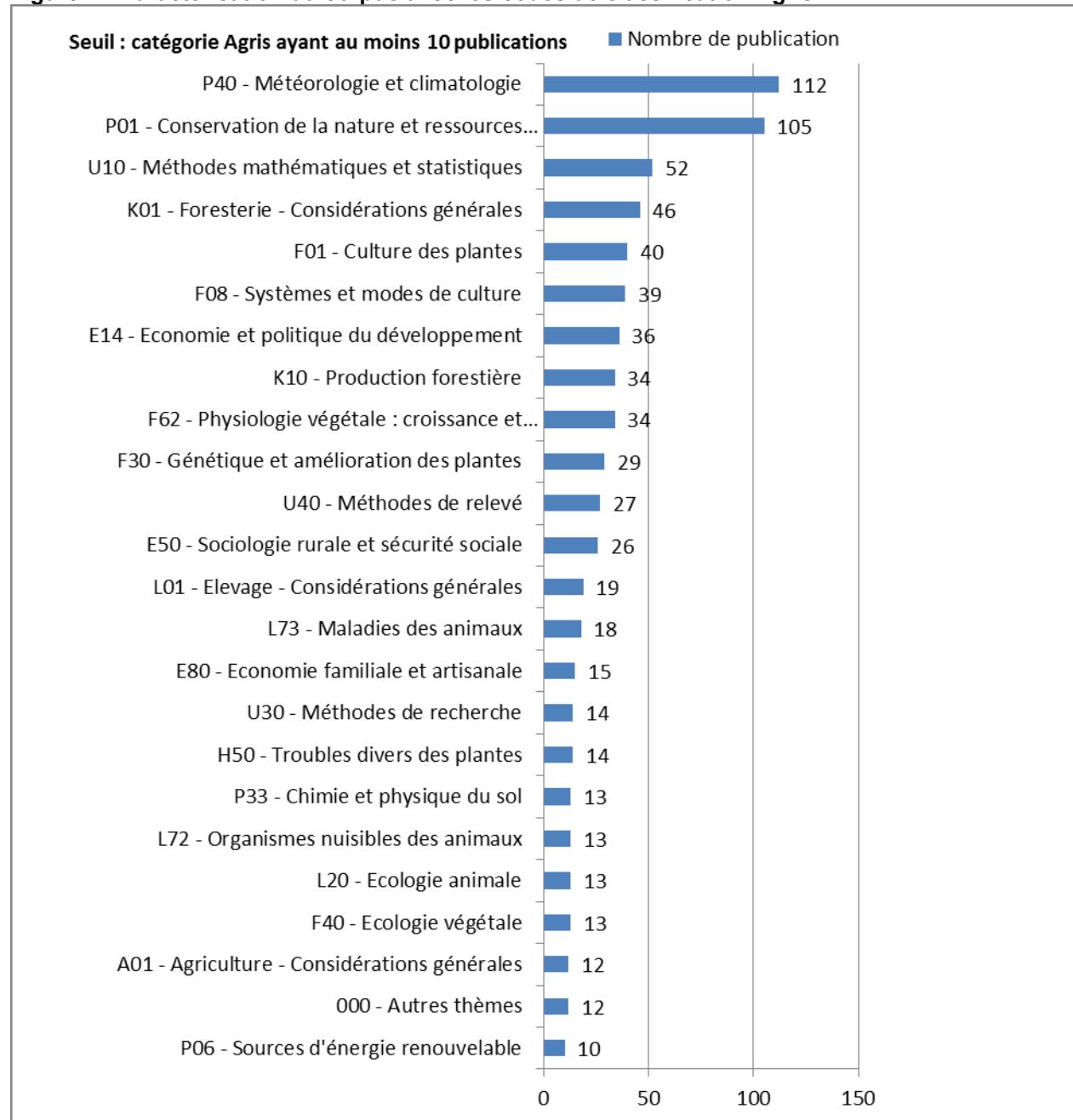
 VOSviewer

5. Caractérisation de l'ensemble du corpus

5.1. Caractérisation du corpus avec les codes de classification Agris

A chacune des 266 références a été attribué un ou plusieurs codes de la classification Agris/Caris de la FAO. Chaque code caractérise une des principales catégories thématiques d'une publication.

Figure 4 : Caractérisation du corpus avec les codes de classification Agris

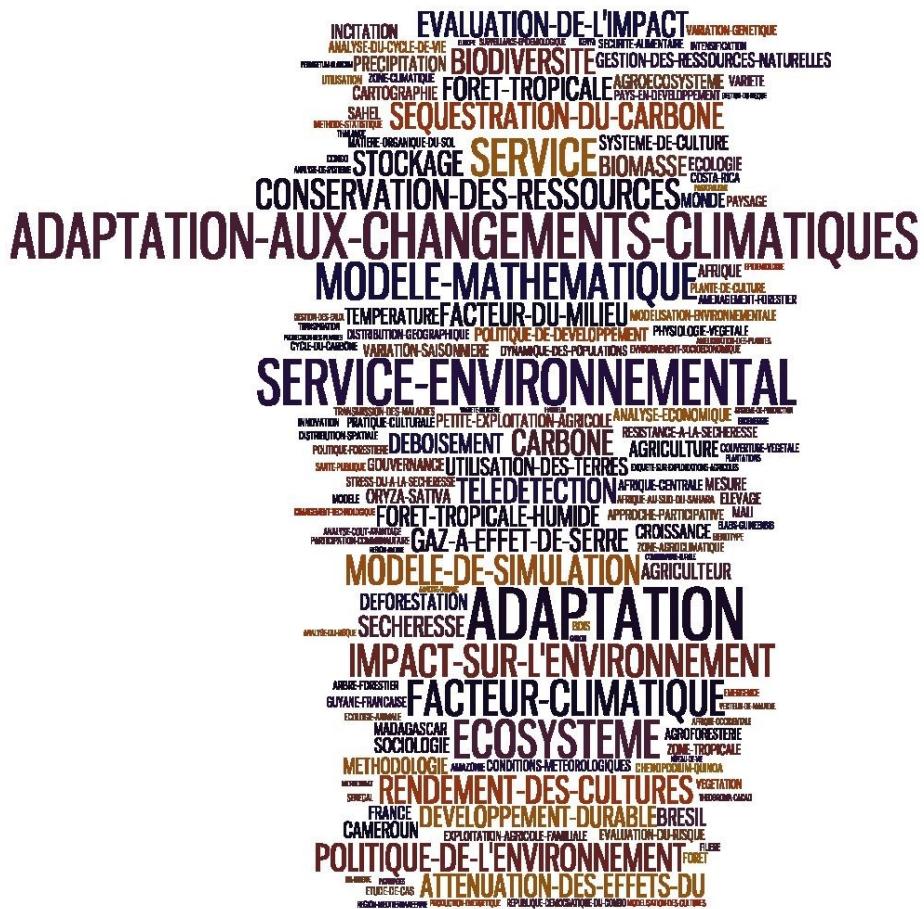


5.2. Caractérisation du corpus avec les descripteurs Agrovoc

Chaque référence a été indexée avec les descripteurs du thésaurus Agrovoc. En fin de document, l'index des descripteurs utilisés détaille pour chacun d'eux le nombre de documents concernés et renvoie vers les références de la bibliographie.

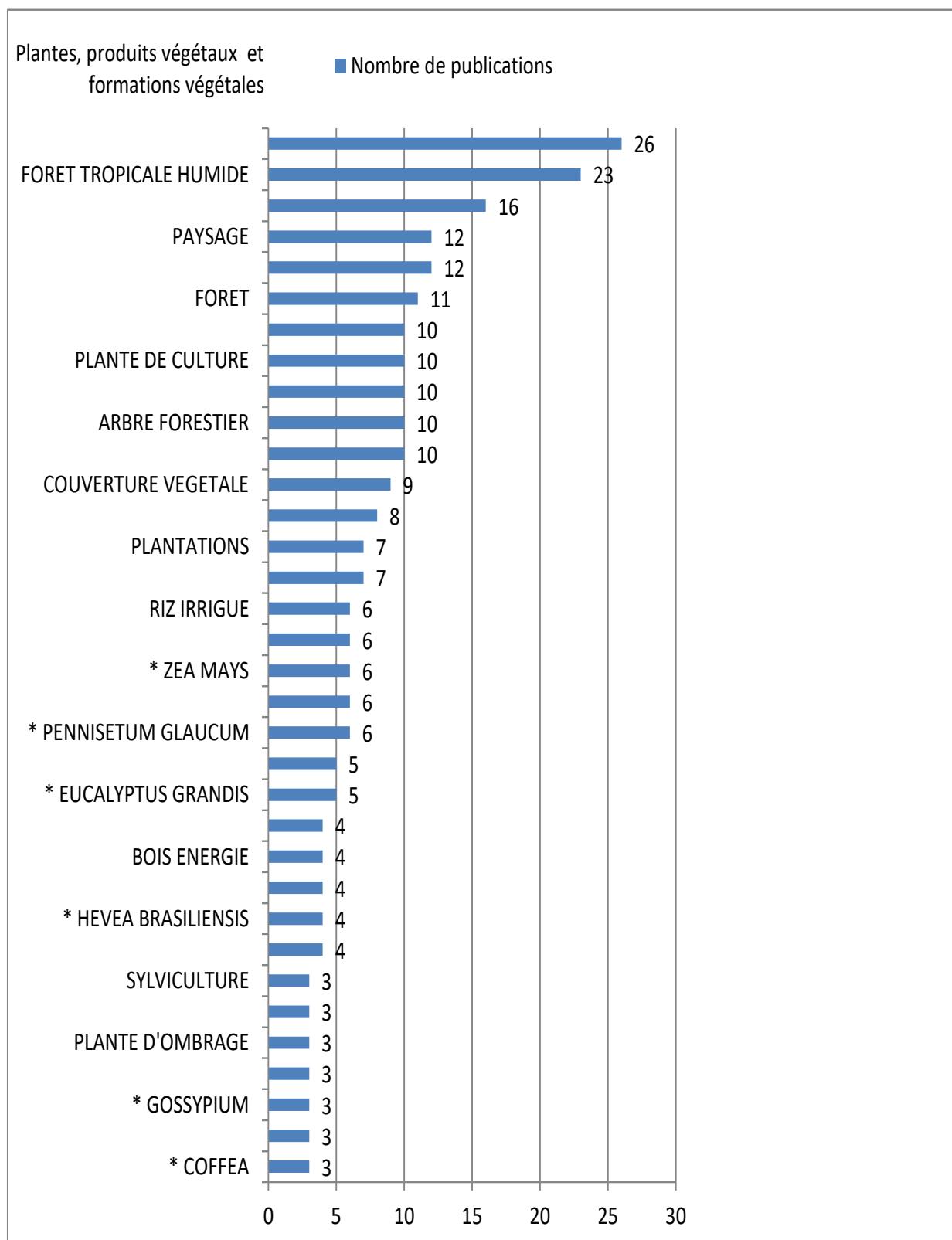
Figure 5 : Cartographie des descripteurs Agrovoc les plus fréquents

Dans la carte le descripteur « changement climatique » a été considéré comme « mot vide ».



6. Principales plantes, produits végétaux et formations végétales

Chaque publication a été indexée avec les descripteurs du thesaurus Agrovoc. Dans le thesaurus Agrovoc, les descripteurs utilisés pour les plantes cultivées sont les noms latins du genre et/ou de l'espèce végétale (par exemple le genre *Gossypium* pour le cotonnier). Les noms communs sont généralement utilisés pour les produits issus des végétaux (par exemple *riz* pour le produit riz).

Tableau 7 : Plantes, produits végétaux et formations végétales : descripteurs Agrovoc les plus fréquents (seuil : 3)

7. Les principaux objets de recherche du Cirad

A partir d'une lecture globale du corpus, les références bibliographiques ont pu être réparties entre cinq grands objets de recherche. Chaque référence est classée dans une seule classe. Pour faciliter la lecture quelques sous-groupes ont été constitués en fonction des occurrences.

Economie, développement et sociologie (32 références)

Ressources naturelles et environnement (**57 références**) : conservation des ressources (terres, sol, eau, biodiversité etc.), climatologie, environnement et politique de l'environnement dont à la fin du thème les sous-groupes :

- Services environnementaux et écosystémiques, carbone, biomasse, croissance
- Ecologie végétale et animale (sauf bioagresseurs), paysage et végétation, conservation des ressources, biodiversité

Productions forestières et conservation des ressources forestières (**75 références**) y compris agroforesterie (café, cacao) dont à la fin du thème les sous-groupes :

- Politique forestière et de l'environnement, gestion forestière et foncière
- Mesure et estimation du carbone, de la biomasse, de la croissance relatives aux arbres et à la forêt, de la déforestation
- Plantations : palmier, eucalyptus, hévéa, et autres publications relatives à une seule espèce d'arbre.
- Agroforesterie dont le cacaoyer et le cafetier

Productions végétales sauf agroforesterie (café, cacao) (**61 références**) : les références sur le riz et le quinoa, ont été regroupées à la fin de ce groupe.

Productions animales et santé animale (41 références)

- Maladie et santé animale avec un regroupement des références relatives aux moustiques et aux tiques
- Production animale et élevage

8. Références bibliographiques

8.1. Economie, développement et sociologie

1

Lipper, L., Thornton, P., Campbell, B. M., Baedeker, T., Braimoh, A., Bwalya, M., Caron, P., Cattaneo, A., Garrity, D. P., Henry, K., Hottle, R., Jackson, L., Jarvis, A., Kossam, F., Mann, W., McCarthy, N., Meybeck, A., Neufeldt, H., Remington, T., Sen, P. T., Sessa, R., Shula, R., Tibu, A., and Torquebiau, E. (2014)

Climate-smart agriculture agriculture for food security

Climate-smart agriculture agriculture for food security

Nature climate change vol.4

Climate-smart agriculture (CSA) is an approach for transforming and reorienting agricultural systems to support food security under the new realities of climate change. Widespread changes in rainfall and temperature patterns threaten agricultural production and increase the vulnerability of people dependent on agriculture for their livelihoods, which includes most of the world's poor. Climate change disrupts food markets, posing population-wide risks to food supply. Threats can be reduced by increasing the adaptive capacity of farmers as well as increasing resilience and resource use efficiency in agricultural production systems. CSA promotes coordinated actions by farmers, researchers, private sector, civil society and policymakers towards climate-resilient pathways through four main action areas: (1) building evidence; (2) increasing local institutional effectiveness; (3) fostering coherence between climate and agricultural policies; and (4) linking climate and agricultural financing. CSA differs from 'business-as-usual' approaches by emphasizing the capacity to implement flexible, context-specific solutions, supported by innovative policy and financing actions. (Résumé d'auteur)

<http://dx.doi.org/10.1038/NCLIMATE2437> Cirad-Agritrop Dk : 574478

Articles publiés dans une revue à facteur d'impact

2

Brockhaus, M., Djoudi, H., and Locatelli, B. (2013)

Envisioning the future and learning from the past: Adapting to a changing environment in northern Mali

Envisioning the future and learning from the past: Adapting to a changing environment in northern Mali
Environmental science and policy vol.25

In West Africa, rural livelihoods depending on natural resources develop coping and adapting strategies to face climate variability or change and economic or political changes. The former Lake Faguibine in northern Mali has experienced drastic ecological, social, and economic changes. Forests have emerged on the former lake and have become important for local livelihoods. This paper analyses the coping and adapting strategies of forest- and livestock-based livelihoods facing ecological changes. Results from field research at different levels indicate that most local strategies are based on diversification including migration within the livestock production system or in complement to it, with differences according to gender, age, and ethnicity. Political discourses, cultural identities, and past experiences influence and shape adaptation strategies at the local level. The sustainability of the observed strategies depends on the access to natural resources and the sustainable management of these resources, which in turn depends on institutions at local and national levels. Many local strategies are reactive to external events but would need strategic support from higher levels to move from coping to adapting. Examples are the development of institutions and technical actions for natural resource management, as well as development actions supporting local strategies and sustainable investments. Researchers, practitioners and development planners will need simple methods and tools for understanding and analysing local adaptation perceptions and actions to achieve an effective support of sustainable and gender-equitable local adaptation and to avoid mismatches between strategies proposed by local and by sub national and national actors. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.envsci.2012.08.008> Cirad-Agritrop Dk : 566514

Articles publiés dans une revue à facteur d'impact

3

D'Aquino, P., and Bah, A. (2013)

Land policies for climate change adaptation in West Africa: A multilevel companion modeling approach

Land policies for climate change adaptation in West Africa: A multilevel companion modeling approach
Simulation and gaming vol.44:n°2-3

Based on 10 years of participatory modeling experience, the authors developed a multilevel participatory modeling process that links national policy makers, local councils, and grassroots stakeholders using a combination of games and computerized simulations. The challenge was to allow the target groups to design and evaluate collective adaptations to climate change that combine new collective rules for local, regional, and national regulations. This article details and highlights the novelty of the methodological process, which allows stakeholders to codesign frameworks for their own behaviors and rules. The experiment uses games and models with soft rules and the stakeholders themselves incorporate their own perceptions both in the board and computerized games. This was shown to be an efficient way to reach assessments and proposals that are shared between local stakeholders and policy makers, and should thus help improve the design of policies to face up to climate changes. (Résumé d'auteur)

<http://dx.doi.org/10.1177/1046878112452689> Cirad-Agritrop Dk : 570495

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

4

Ahmadi, N., Bastien, C., and Trommetter, M. (2013)

Observations, innovations et adaptations au changement climatique. In "S'adapter au changement climatique : agriculture, écosystèmes et territoires. - Versailles : Ed. Quae, 2013", pp. 61-73.

Cirad-Agritrop : CD_P40 SOU 16668; BA_P40 SOU 5747 Dk : 570824

5

Vall, E., Blanchard, M., Koutou, M., Coulibaly, K., Adiallo, M., Chia, E., Traoré, L., Tani, F., Andrieu, N., Ouattara, B., Dugué, P., and Autfray, P. (2013)

Recherche-action en partenariat et innovations face aux changements globaux en Afrique subsaharienne

Recherche-action en partenariat et innovations face aux changements globaux en Afrique subsaharienne

Agronomie africaine n°6, spec.

Les paysans de l'Afrique subsaharienne doivent innover pour accroître durablement la production agricole, pour contribuer à la sécurité alimentaire et pour s'adapter aux changements globaux (climatiques, démographiques, etc.). Mais force est de reconnaître que la majorité des modèles de changement proposés par la recherche n'ont pas été adoptés par les paysans. L'une des raisons invoquée est leur manque d'implication active dans les processus de recherche. La Recherche Action en Partenariat (RAP) vise à remédier à cette insuffisance. Cette communication présente les principes et les dispositifs méthodologique de la RAP en s'appuyant sur le projet Fertipartenaires (Food/2007/144/075, 2008 à 2012). L'objectif du projet était de co-construire des innovations visant à relever la fertilité du sol en appliquant une démarche de RAP. La RAP s'appuie sur des plateformes d'innovations villageoises (Comité de Concertation Villageois, CCV) et se déroule en 4 phases (diagnostics, élaboration de solutions, actions, évaluation des résultats et impacts). Les CCV sont des associations de groupements paysans permettant d'enrôler les agriculteurs et éleveurs dans toutes les phases de la co-construction de l'innovation. La phase de diagnostic a permis de dresser un état des lieux des systèmes de production. La phase d'exploration des solutions a nécessité la mise en œuvre de formations et de voyages à destination des membres des CCV. La phase de mise en œuvre a permis d'expérimenter des innovations techniques (1 600 fosses fumière/compostières, 600 expérimentations de techniques culturelles innovantes) et organisationnelle (1 charte foncière locale communale). La phase d'évaluation a permis d'estimer l'impact du projet sur les connaissances acquises, les changements de pratiques, leurs effets et leur diffusion. En favorisant l'échange et l'hybridation des connaissances entre paysans, acteurs de l'environnement des exploitations et chercheurs, la RAP renforce les capacités d'innovations et d'adaptation des acteurs face aux changements globaux. (Résumé d'auteur)

Cirad-Agritrop Dk : 572283

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

6

Zorom, M., Barbier, B., Mertz, O., and Servat, E. (2013)

Diversification and adaptation strategies to climate variability: A farm typology for the Sahel

Diversification and adaptation strategies to climate variability: A farm typology for the Sahel

Agricultural systems vol.116

Sahelian farmers tend to diversify their activities to reduce their vulnerability to external shocks. It is important to distinguish between farmers' types response to these shocks as well as to policy incentives. To develop a typology of farmer adaptation strategies, evaluate the level of vulnerability and assess perceptions of policies, two detailed questionnaire surveys were conducted in a community in northern Burkina Faso. Statistical analysis included a cluster analysis to distinguish farmers' types with regard to their assets and strategies. The results show that the main factors of discrimination were family size, access to small irrigation plots and number of animals. The types react differently to climate variability and are likely to follow contrasting pathways of adaptation. Farmers' food vulnerability is still high according to the applied CILSS vulnerability index, and farmers are pessimistic about their capacity to handle future droughts. They see improved credit schemes and further development of irrigation as the most promising adaptation strategies. (Résumé d'auteur)

<http://dx.doi.org/10.1011/j.agry.2012.11.004> Cirad-Agritrop Dk : 567415

Articles publiés dans une revue à facteur d'impact

7

Faysse, N., Rinaudo, J.-D., Bento, S., Richard-Ferroudji, A., Errahj, M., Varanda, M., Imache, A., Dionnet, M., Rollin, D., Garin, P., Kuper, M., Maton, L., and Montginoul, M. (2014)

Participatory analysis for adaptation to climate change in Mediterranean agricultural systems: possible choices in process design

Participatory analysis for adaptation to climate change in Mediterranean agricultural systems: possible choices in process design

Regional Environmental Change vol.14:n°1, suppl.

There is an increasing call for local measures to adapt to climate change, based on foresight analyses in col- laboration with actors. However, such analyses involve many challenges, particularly because the actors concerned may not consider climate change to be an urgent concern. This paper examines the methodological choices made by three research teams in the design and implementation of participatory foresight analyses to explore agricultural and water management options for adaptation to climate change. Case studies were conducted in coastal areas of France, Morocco, and Portugal where the groundwater is intensively used for irrigation, the aquifers are at risk or are currently overexploited, and a serious agricultural crisis is underway. When designing the participatory processes, the researchers had to address four main issues: whether to avoid or prepare dialogue between actors whose relations may be limited or tense; how to select participants and get them involved; how to facilitate discussion of issues that the actors may not initially consider to be of great concern; and finally, how to design and use scenarios. In each case, most of the invited actors responded and met to discuss and evaluate a series of scenarios. Strategies were discussed at different levels, from farming practices to aquifer management. It was shown that such participatory analyses can be implemented in situations which may initially appear to be unfavourable. This was made possible by the flexibility in the methodological choices, in particular the possibility of framing the climate change issue in a broader agenda for discussion with the actors. (Résumé d'auteur)

<http://dx.doi.org/10.1007/s10113-012-0362-x> Cirad-Agritrop Dk : 572237

Articles publiés dans une revue à facteur d'impact

8

Bazile, D., Martinez, E. A., Negrete Sepulveda, J., Thomet, M., Chia, E., Hocdé, H., and Nuñez, L. (2014)

Biocultural Heritage: Quinoa as an important resource to be maintained through tourism experiences for food security in the face of climate change

Biocultural Heritage: Quinoa as an important resource to be maintained through tourism experiences for food security in the face of climate change

Tourism, Leisure and Global Change vol.1

The regions in Chile where quinoa is grown share certain features, namely the marginality of farmers, cultural and geographic isolation, and long distances to markets. Yet there is an increasing global awareness of quinoa's high nutritional value and the heritage value of its biodiversity. This research aimed to develop a sustainable alternative to traditional agriculture through rural tourism that highlights the value of local landrace diversity and associated farming practices. The FAO recognizes the important contribution of generations of farmers in shaping agricultural landscapes whose cultural and

agricultural components jointly reflect the evolution of local farming systems. The world heritage value of this agricultural diversity renders agrotourism a relevant approach to its conservation. We studied three regions in Chile where attempts to associate tourism and quinoa are underway: Aymaras communities on the northern Highlands, farming communities of Spanish descent in the centre, and Mapuche farmers in the south. The agrotourism form mobilized in each region is analyzed strategically by combining the study of tourism supply and demand. The three approaches to preserving the heritage of the quinoa crop in Chile are adapted to specific local contexts and territories. Whether it is to define a hiking trail in the North, entice tourists off established tourist circuits in the centre, or to develop a new endogenous tourism economy among the Mapuche, agrotourism takes different forms where the maintenance of quinoa's agricultural heritage allows relations between farming and tourism activities, market and non-market goods, and cultural and natural goods to be explored. (Résumé d'auteur)

<http://www.igutourism.com/issue/view/1067/showToc> Cirad-Agritrop Dk : 573690

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

9

Balbi, S., Giupponi, C., Perez, P., and Alberti, M. (2013)

A spatial agent-based model for assessing strategies of adaptation to climate and tourism demand changes in an alpine tourism destination

A spatial agent-based model for assessing strategies of adaptation to climate and tourism demand changes in an alpine tourism destination

Environmental modelling and software vol.45

A vast body of literature suggests that the European Alpine Region is amongst the most sensitive socioecosystems to climate change impacts. Our model represents the winter tourism socio-ecosystem of Auronzo di Cadore, located in the Dolomites (Italy), which economic and environmental conditions are highly vulnerable to climate variations. This agent-based model includes eight types of agents corresponding to different winter tourist profiles based on their socio-economic background and activity targets. The model is calibrated with empirical data while results are authenticated through direct interaction of local stakeholders with the model. The model is then used for assessing three hypothetical and contrasted infrastructure-oriented adaptation strategies for the winter tourism industry, that have been previously discussed with local stakeholders, as possible alternatives to the "business-as-usual" situation. These strategies are tested against multiple future scenarios that include: (a) future weather conditions in terms of snow cover and temperature, (b) the future composition and total number of tourists and (c) the type of market competition. A set of socio-economic indicators, which are strongly coupled with relevant environmental consequences, are considered in order to draw conclusions on the robustness of the selected strategies. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.envsoft.2012.10.004> Cirad-Agritrop Dk : 571785

Articles publiés dans une revue à facteur d'impact

10

Dumas, P., and Ha-Duong, M. (2013)

Optimal growth with adaptation to climate change

Optimal growth with adaptation to climate change

Climatic change vol.117:n°4

We find that approximately a quarter of the world's productive capital could be sensitive to climate; therefore, this capital faces the risk of accelerated obsolescence in a world warming by an average of 0.2 °C per decade. We examine the question of optimal adaptation to climate change in a vintage capital growth model without uncertainty. Along the optimal pathway, adaptation is proactive with an anticipation period of approximately twenty years. While there is additional investment in this scenario compared with a no-climate-change baseline, the overall cost to adapt is low relative to the potential losses from maladaptation. Overinvestment in protection capital allows the economy to be consistently well-adapted to climate; thus, such a policy prevents transient maladaptation costs. Sensitivity analysis with an integrated assessment model suggests that costs could be ten times larger if adaptation only begins after vulnerable sectors are impacted. (Résumé d'auteur)

<http://dx.doi.org/10.1007/s10584-012-0601-7> Cirad-Agritrop Dk : 570653

Articles publiés dans une revue à facteur d'impact

11

Mwongera, C. N., Boyard-Micheau, J., Baron, C., and Leclerc, C. (2014)

Social process of adaptation to environmental changes: How eastern african societies intervene between crops and climate

Social process of adaptation to environmental changes: How eastern african societies intervene between crops and climate

Weather, climate, and society vol.6:n°3

Studies on climate change can only be conducted on a long time scale, and observing how societies adapt their sowing practices to climate variability is challenging and costly. As an alternative, a space and time substitution design was used, changes in space corresponding to that induced in time by environmental change. On the eastern slope of Mount Kenya, the Tharaka community, originating from the lowlands (750 m), moved up to the midlands (950 m) with their lowland-adapted resources, whereas the Mwimbi, originating from wetter upland (1100 m), moved down to the midlands with their highland-adapted genetic resources. A weather station was installed at 950 and 1100 m, and a logistic model was used to analyze the probability of sowing failure as a function of the length of dry spells after sowing. A total of 1691 plots in 40 surveyed farms were surveyed to compare the Mwimbi and Tharaka during 2 yr and four growing seasons, controlling crops and altitude. Although seed-sowing practices were similar in both communities, the relative risk of sowing failure was 3.3 times more for the Mwimbi than for the Tharaka during the Short Rains, and 1.5 times more during the Long Rains. This difference can be explained by within-community seed exchanges, as Tharaka seeds, originally from the lowlands, are adapted to drier conditions, whereas Mwimbi seeds are adapted to wetter conditions. The findings suggest an impact of historical and social factors on the mitigation of sowing failure risk. Thus, they must be considered as an integral part of the adaptation process to climate variability and change. (Résumé d'auteur)

<http://dx.doi.org/10.1175/WCAS-D-13-00034.1> Cirad-Agritrop Dk : 573937

Articles publiés dans une revue à facteur d'impact

12

Djoudi, H., Brockhaus, M., and Locatelli, B. (2013)

Once there was a lake: Vulnerability to environmental changes in northern Mali

Once there was a lake: Vulnerability to environmental changes in northern Mali

Regional Environmental Change vol.13:n°3

Vulnerability assessment is increasingly recognised as a starting point to identify climate adaptation needs and improve adaptive capacity. However, vulnerability assessments are challenging because of the complexity of multifaceted biophysical, human and institutional factors, interacting at different scales and levels within socio-ecological systems. Using a participatory approach across levels and genders, this paper explores the vulnerability of livestock- and forest-based livelihoods to climate variability and change in Lake Faguibine, northern Mali, where drastic ecological, political and social changes have occurred. Our results show that the distribution of vulnerabilities within livelihoods and groups shifted when the ecosystem evolved from a lake to a forest. New vulnerability drivers have emerged, related to resources availability, access and power relations. In addition, political interests and psychological barriers hinder the local transition to an equitable and sustainable use of forest ecosystem services. Divergent perceptions, social identities, interests and power explained why different actors-governmental and non-governmental, men and women, local, sub-national and national-differed in their vulnerability assessments. This is exemplified in the way actors at different levels and of different gender analysed the effects of herders' mobility and in the way women analysed men's migration. This case study confirms the need for participatory and gender-sensitive vulnerability assessments across different scales and levels that consider the interaction between socio-ecological systems and the dynamics and distribution of vulnerability across different social sub-systems. (Résumé d'auteur)

<http://dx.doi.org/10.1007/s10113-011-0262-5> Cirad-Agritrop Dk : 568955

Articles publiés dans une revue à facteur d'impact

13

Leclerc, C., Mwongera, C. N., Camberlin, P., and Boyard-Micheau, J. (2013)

Indigenous past climate knowledge as cultural built-in object and its accuracy

Indigenous past climate knowledge as cultural built-in object and its accuracy

Ecology and society vol.18:n°4, article 22

In studying indigenous climate knowledge, two approaches can be envisioned. In the first, traditional knowledge is a cultural built-in object; conceived as a whole, its relevance can be assessed by referring to other cultural, economic, or technical components at work within an indigenous society. In the second, the accuracy of indigenous climate knowledge is assessed with western science knowledge used as an external reference. However, assessing the accuracy of indigenous climate

knowledge remains a largely untapped area. We aim to show how accurate the culturally built indigenous climate knowledge of extreme climatic events is, and how amenable it is to fuzzy logic. A retrospective survey was carried out individually and randomly among 195 Eastern African farmers on climatic reasons for loss of on-farm crop diversity from 1961 to 2006. More than 3000 crop loss events were recorded, and reasons given by farmers were mainly related to droughts or heavy rainfall. Chi-square statistics computed by Monte Carlo simulations based on 999 replicates clearly rejected independence between indigenous knowledge of drought and heavy rainfall that occurred in the past and rainfall records. The fuzzy logic nature of indigenous climatic knowledge appears in the clear association of drought or heavy rainfall events, as perceived by farmers, with corresponding extreme rainfall values, contrasting with a fuzzy picture in the intermediate climatic situations. We discuss how the cultural built-in knowledge helps farmers in perceiving and remembering past climate variations, considering the specificity of the contexts where extreme climatic events were experienced. The integration of indigenous and scientific climate knowledge could allow development of drought monitoring that considers both climatic and contextual data. (Résumé d'auteur)

<http://dx.doi.org/10.5751/ES-05896-180422> Cirad-Agritrop Dk : 571180

Articles publiés dans une revue à facteur d'impact

14

Feschet, P., Macombe, C., Garrabé, M., Loeillet, D., Saez, A. R., and Benhmad, F. (2013)

Social impact assessment in LCA using the Preston pathway

Social impact assessment in LCA using the Preston pathway

International journal of life cycle assessment vol.18:n°2

Purpose The purpose of the social Life Cycle Assessment (LCA) method is to predict the social impacts on people caused by the changes in the functioning of one product chain throughout its life cycle. Changes in health status are very important experiences for people. The aim of this paper is to build a pathway between changes in economic activity generated by the functioning of a product chain and the changes in health status of the population in the country where the economic activity takes place. Methods Empirical and historical factors suggest that increased economic activity through growth in income leads to improvements in the health of a country's population. This empirical relationship is well known in economics as the Preston curve. Using this relationship, we design a pathway for social LCA impact assessment. This pathway may be used to explain or predict the potential impact caused by the modification of one product sector upon the health of a population. The Preston relationship usually is calculated for a cross section of countries. We assess whether the Preston relationship is valid when a single country is considered alone. Drawing from scientific literature regarding development, we define the context where the use of the Preston relationship is justified. We describe the general design of the Preston pathway, using a recalculated (panel based) relationship, and specify the conditions for its use. We apply it to the case of company B, a banana industry in Cameroon, for the period between 2010 and 2030. Results We highlight that the panel calculation of the Preston relationship remains significant when a country is considered alone. We suggest that the following conditions are required for the pathway to be used: (1) the activity is set within countries where the GDP per capita in purchasing power parity is less than \$10,000 at the start of the period, (2) the assessed activity accounts for a significant part of the annual GDP and/or demonstrates obvious signs that it represents a huge stake in the country's economy, (3) the duration of the assessed activity is regular and long enough, and (4) the added value created by the activity is shared within the country. We found that the future activity of company B would improve the potential LEX of the entire population of Cameroon by 5 days over 20 years, based on 200,000 t of bananas exported annually (in comparison with no activity). Conclusions When the four conditions for use are met, and provided results are interpreted by comparing them with other situations or countries, the recalculated panel-based relationship may be used to explain or predict a change in potential life expectancy generated by a change in economic activity. The Preston pathway may be useful for impact assessment in social LCA. The assessment is valid only when used for a comparative analysis and must be done within a multi-criteria framework. Complementary pathways therefore need to be designed. We suggest that the conditions for use and other research issues be discussed and fine-tuned further. Moreover, we welcome comments and criticisms. (Résumé d'auteur)

<http://dx.doi.org/10.1007/s11367-012-0490-z> Cirad-Agritrop Dk : 567356

Articles publiés dans une revue à facteur d'impact

15

Feschet, P. (2014)

Analyse de Cycle de Vie Sociale. Pour un nouveau cadre conceptuel et théorique. Thèse, UM1, CIRAD-ES-UMR ART-DEV, CIRAD-PERSYST-UPR Systèmes bananes et ananas. XXIV-352 p.
 Le renforcement des préoccupations vis-à-vis des problématiques de développement, de bien-être des populations et de qualité des écosystèmes, génère de nouvelles pressions économiques (labels, cahiers des charges, etc.), normatives (règlements, fiscalité), et de la société civile (consom'action, boycott), et impose aux entreprises de prendre en compte ces problématiques, c'est-à-dire d'identifier, d'évaluer, et d'améliorer leurs impacts. De nombreux outils existent pour évaluer les impacts des chaînes de produits mais seules les méthodes d'Analyse de Cycle de Vie permettent d'avoir une évaluation multicritère et globale, et de rendre compte des transferts d'impacts d'une étape à l'autre du cycle de vie et d'un impact à l'autre. Le développement de l'ACV sociale est vivement souhaité et réclamé par les acteurs. La problématique de cette thèse a consisté à s'interroger sur les principes d'élaboration d'une telle méthode, son cadre conceptuel, théorique et méthodologique. Les besoins de recherche identifiés étant nombreux, les contributions spécifiques de cette thèse ont été triples : i) proposer un nouveau cadre théorique et conceptuel adressant les problématiques de bien-être et de développement, ii) élaborer une relation permettant d'évaluer les impacts de la création d'activité économique et de revenus sur la santé des populations, le " pathway Preston " iii) proposer un cadre méthodologique articulant le Modèle à Capitaux Multiples et le concept de capacités. Les filières agroalimentaires et plus particulièrement les filières d'importation de fruits et légumes tropicaux, ont servi de cadre empirique à ce travail. (Résumé d'auteur)

Cirad-Agritrop Dk : 573402

16

Feintrenie, L., and Affholder, F. (2014)

Contribuer aux systèmes écologiques et sociaux. In "Agricultures familiales et mondes à venir. - Versailles : Ed. Quae, 2014", pp. 97-110.

Cirad-Agritrop : BA_E20 SOU 5834 Dk : 572818

17

Lemoalle, J.-É. s., Magrin, G.-É. s., Ngaressem, G. M.-c., Ngounou Ngatcha, B.-c., Raimond, C.-c., and Issa, S.-c. (2014)

Le développement du lac Tchad : situation actuelle et futurs possibles, IRD [Marseille], Marseille. 2-7099-1836-6 215 p.

Le lac Tchad et son avenir sont au cœur des préoccupations politiques régionales et internationales. Cet espace vital, à la charnière de l'Afrique de l'Ouest et de l'Afrique centrale, a longtemps fasciné, depuis les géographes arabes au Moyen-âge jusqu'aux explorateurs européens du xixe siècle. Il suscite aujourd'hui des interrogations fortes sur l'environnement, l'eau, le climat et le développement régional. Le lac Tchad va-t-il s'assécher ? Quelles seraient alors les conséquences pour les 13 millions d'hommes qui en dépendent, sur un rayon de 300 km ? Les discours publics qui traitent de l'avenir du lac Tchad, le plus souvent alarmistes, sont dans l'ensemble sources d'une grande confusion et entretiennent une image brouillée de la situation. Une connaissance précise des réalités est pourtant nécessaire pour construire une vision partagée de cet avenir et adopter une stratégie qui permette de relever les défis du développement durable du lac. La Commission du bassin du lac Tchad (CBLT) a commandé à l'Institut de recherche pour le développement (IRD) une expertise collégiale sur la préservation et le développement du lac Tchad. Cette expertise, réalisée par un collège d'experts pluridisciplinaire et paritaire Nord-Sud, recense les connaissances actuelles sur le lac et identifie les différents choix politiques susceptibles de stimuler son développement. Elle aboutit à une série de recommandations utiles aux décideurs politiques en matière de soutenabilité environnementale, de sécurité alimentaire et d'emploi. (Résumé d'auteur)

Cirad-Agritrop : BA_P10 LEM 5922 Dk : 575101

18

Magrin, G. (2013)

Les ressources du lac Tchad : aménager ou s'adapter? In "Une nouvelle ruralité émergente : Regards croisés sur les transformations rurales africaines. - Montpellier : CIRAD, 2013", pp. 40-41.

Cirad-Agritrop : CD_BR21304 Dk : 569593

19

Magrin, G. (2013)

Lake chad's resources: intervention or adaptation? In "A new emerging rural world : An overview of rural change in Africa. - Montpellier : CIRAD, 2013", pp. 42-43.

Given the context of rapid population growth, the potential offered by the water and fertile soils of Lake Chad is both real and under pressure. While it is true that the lake is exposed to climatic uncertainty, it is especially subject to the governance challenges presented by an area which is split between four states and also attracts the attention of the international community. In the current context notable for the revival of developmental projects, critical decisions need to be taken about the vocation of the lake and the forms of intervention which should be prioritised. (Résumé d'auteur)
http://www.nepad.org/system/files/WEB%20-20Atlas%20NEPAD_English%20version_May%202013%202014.pdf Cirad-Agritrop : CD_BR21305; CD_BR21317 Dk : 569625

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Muller, B., and Leblois, A. (2013)

Aléas, développement et assurances agricoles. In "Le développement durable à découvert. - Paris : CNRS, 2013", pp. 186-187.

Cirad-Agritrop : CD_P01 EUZ 16727; BA_P01 EUZ 5806 Dk : 572042

21

Maury, C., Augusseau, X., Aznar, O., Bonin, M., Bonnal, P., Daré, W. s., Decamps, M., Jeanneaux, P., and Caron, A. (2013)

Governance across multiple levels of agri-environmental measures in France. In "Governing the provision of ecosystem services. - Dordrecht : Springer [Pays-Bas], 2013", pp. 255-277.

The notion of ecosystem services appeared late in France, which has been reluctant to adopt this idea, choosing instead to defend the concept of the multifunctionality of agriculture. The French position is analysed considering the emergence and then the removal of multifunctionality in the international agenda for agricultural negotiations, followed by the rise of ecosystem services (services provided by ecosystems to society) and environmental services (produced by actors). These trends are reflected by the French agri-environmental measures: a sense of acknowledging and valuing the multifunctionality of agriculture for the management, at the margin, of environmental issues in agricultural policy. (Résumé d'auteur)

http://dx.doi.org/10.1007/978-94-007-5176-7_13 Cirad-Agritrop : CD_P01 MUR 16272 Dk : 567503

22

Dedieu, B., Ancey, V., and Avelange, I. (2013)

Agir en situation d'incertitude en agriculture. Dynamiques de protection et d'adaptation au Nord et au Sud : [Introduction]. In "Agir en situation d'incertitude en agriculture : regards pluridisciplinaires au Nord et au Sud. - Bruxelles : PIE-Peter Lang, 2013", pp. 13-17.

Cirad-Agritrop : CD_E50 ANC 16493 Dk : 569830

23

Ancey, V.-É. s., Avelange, I.-É. s., and Dedieu, B.-É. s. (2013)

Agir en situation d'incertitude en agriculture : regards pluridisciplinaires au Nord et au Sud, PIE-Peter Lang, Bruxelles. 422 p.

Présentation de l'éditeur : Agir en situation d'incertitude est une question de survie dans les mondes paysans. Chaque année climatique diffère d'une autre, et la fluctuation des prix sur les marchés mondialisés se répercute dans la plupart des pays. À plus long terme, l'ampleur et la nature même du changement global demeurent des inconnues, obligeant les acteurs agricoles et ruraux à développer des dynamiques d'adaptation et de sécurisation tenant compte des questionnements techniques, écologiques, économiques, politiques et sociaux à différentes échelles, du local à l'international. Cet ouvrage propose de sortir des analyses en termes de risques et d'assurances et offre de nouvelles approches pour rendre compte de l'incertain, du complexe, du long terme, et des capacités des systèmes à tenir, à se transformer, à apprendre d'un environnement en changement. Les auteurs sont des chercheurs qui pratiquent l'échange interdisciplinaire, mais aussi des acteurs du développement. Le pari du regard croisé des disciplines, biotechniques et sciences sociales, se double de la volonté de confronter des réalités du Nord et du Sud. Que ce soit en Europe, en Afrique, ou en Amérique du Sud, le rapport au changement et les protections mises en place face à l'incertitude, sont des constructions socio-techniques. Contenu : Introduction : Agir en situation d'incertitude en agriculture, dynamiques de production et d'adaptation au Nord et au Sud (Benoît Dedieu, Véronique Ancey, Isabelle, Avelange).I. Maîtriser les normes. Vers un nouveau concept de risque (Gilles Motet, Éric Marsden). Différents rapports à l'incertitude dans l'aide au développement. Une expertise sur l'hydraulique pastorale au Tchad (Véronique Ancey, Gérard Azoulay). Les assurances agricoles

basées sur des indices météorologiques. Bilan des connaissances et agenda de recherche (Antoine Leblois, Philippe Quirion). Réduire l'incertitude lors d'un changement de pratiques au moyen de la rationalité communicationnelle (Jean-Pierre Del Corso). II. Accompagner l'action. Repères pour un management des situations extrêmes de gestion (Pascal Lièvre). Des injonctions de développement créatrices d'incertitude (Astou Diao Camara). Des repères pour l'accompagnement collectif des agriculteurs en situation de crise. L'expérience des associations de formation collective à la gestion (Pierre Lacroix, Gabrielle Sicard, Joo Zimmermann). Engager des agriculteurs à répondre à l'injonction d'adapter la gestion de l'eau au changement climatique. Éléments pour la conception de démarches prospectives participatives (Audrey Richard-Ferroudji, Jean-Daniel Rinaudo, Patrice Garin, Marlène Matingon, Laure Maton, Marielle Montginoul, Dominique Rollin). Pratiques et savoirs d'agriculteurs en AB et de bergers/éleveurs face à l'aléa et au risque. L'apport des concepts d'écosavoir et d'écoformation pour expliciter les formes du savoir-agir dans un monde incertain (Anne Moneyron). III. Comprendre les dynamiques. Sécurisation des systèmes pastoraux au Sahel face aux incertitudes. Démarches et enseignements (Bernard Bonnet, Bobé Sambo, Dominique Héault). Pionniers d'Amazonie : une vision particulière de l'incertitude (Jean-François Tourrand, Vania Vaz, Jonas Basto da Veiga, Soraya Abreu de Carvalho, Darcisio Quanz, René Poccard-Chapuis) Prise de risque ou logique assurantielle. L'irrigation sous tension en région méditerranéenne (Jean-Paul Billaud, Élise Temple-Boyer). Quels rôles pour l'élevage dans la sécurisation des familles ? Une approche par les trajectoires sociotechniques dans le Ferlo sénégalais (Claire Manoli, Christian Corniaux, Alexandre Ickowicz, Charles-Henri Moulin, Benoît Dedieu). La diversification : au-delà de la sécurisation, quels enjeux dans les exploitations d'élevage ? Étude de cas dans les Alpes (Sophie Madelrieux, Laurent Dobremez, Benoît Dedieu). IV. Instrumenter, modéliser. Incertitude contingente, adversité tychastique (Marie-Hélène Durand, Anya Desilles, Alexandra Fronville). Indicateurs de sécurité et de restauration dynamiques (Isabelle Alvarez, Sophie Martin, Olivier Dordan, Xavier Litrico, Patrick Saint-Pierre). Incertitude des modèles utilisés pour l'analyse des risques agro-environnementaux (David Makowski). Contractualisation et élevages laitiers. Le comportement des éleveurs face au risque de prix (Geoffroy Belhenniche, Sabine Tréguer, Jean Cordier). Entre gestion des risques et projets de vie. Une approche conceptuelle illustrée pour une relecture des pratiques agro-sylvo-pastorales en milieux contraignants (Didier Genin). De la survie à la résilience ? Adaptations des paysans à l'insécurité militaire autour de Paoua (RCA) (Benoît Lallau, Emmanuel Mbetid-Bessane). V. L'incertitude et le développement durable. Notre monde a-t-il un avenir ? (Andreu Solé). L'incertitude du développement durable (François Régis Mahieu). Le développement durable. Combiner déterminisme et intentionnalité pour affronter l'incertitude (Bernard Hubert). L'individu et le collectif dans le traitement de l'incertitude. Le point de vue d'un sociologue (Jean-Paul Billaud)

Cirad-Agritrop : CD_E50 ANC 16493; BA_E50 ANC 5772 Dk : 569730

24

Jankowski, F., and Le Marec, J. (2014)

Légitimation des savoirs environnementaux dans un programme de recherche participative au Sénégal

Légitimation des savoirs environnementaux dans un programme de recherche participative au Sénégal

Natures sciences sociétés vol.22:n°1

La participation est devenue une injonction de modernisation d'une recherche intégrée à des enjeux économiques et sociaux. De précédentes études ont décrit la manière dont la prise en compte des savoirs locaux dans le cadre de recherches participatives implique des remaniements de ces savoirs pour qu'ils répondent à des critères de scientificité. Cet article se propose d'observer les processus de légitimation des savoirs locaux à l'œuvre non pas a posteriori mais au cours d'une recherche participative. Les modes de légitimation des savoirs scientifiques sont également questionnés. Il s'agit d'observer le processus dialectique entre définition de savoirs et rapports de légitimité dans les recherches participatives. Le lien entre processus de légitimation et réappropriation des savoirs issus de l'action collective est discuté. (Résumé d'auteur)

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Articles publiés dans une revue à comité de lecture, sans facteur d'impact

25

Wopereis, M., Diagne, A., Johnson, D. E., and Seck, P. A. (2013)

Realizing Africa's rice promise: priorities for action. In "Realizing Africa's rice promise. - Wallingford : CABI, 2013", pp. 424-436.

Cirad-Agritrop : CD_X130 WOP 16735 Dk : 572572

26

Bélieres, J.-F., Bonnal, P., Losch, B., Marzin, J., and Sourisseau, J.-M. (2014) **Les agricultures familiales du monde : définitions, contributions, et politiques publiques**, AFD, Paris. 195 p.

Les agricultures familiales sont au cœur des transformations mais aussi des contradictions contemporaines de l'agriculture. Elles ont été et sont toujours le creuset d'innombrables innovations ainsi que des grandes révolutions agricoles. Elles forment la base sociale de la plupart des pays des Suds et contribuent à l'approvisionnement de leurs marchés locaux, nationaux et internationaux. Néanmoins, elles constituent, de manière paradoxale, la grande masse des ménages ruraux pauvres et en situation d'insécurité alimentaire à l'échelle mondiale. Elles opèrent parfois selon des modèles intensifiés (agrochimie et motorisation), spécialisés et très fortement artificialisés. À ce titre, elles n'échappent pas aux questions et critiques adressées à l'agriculture et à sa capacité à répondre aux défis contemporains et largement mondialisés du changement climatique, de la sécurité alimentaire, de la raréfaction des ressources fossiles, de la prévention des maladies émergentes. Mais, les agricultures familiales sont également porteuses de modèles de production alternatifs à l'intensification conventionnelle - modèles d'agriculture durable ou nouvelles sources énergétiques - qui les différencient des agricultures de firmes et qui peuvent apporter des solutions aux défis alimentaires, sociaux et environnementaux de la planète. (Résumé d'auteur)

<http://www.afd.fr/webdav/site/afd/shared/PUBLICATIONS/RECHERCHE/Scientifiques/A-savoir/28-A-Savoir.pdf> Cirad-Agritrop Dk : 574772

27

Dounias, E., De Visscher, M.-N., Ickowicz, A., and Clouvel, P. (2013)

Les sociétés à agriculture de subsistance. In "S'adapter au changement climatique : agriculture, écosystèmes et territoires. - Versailles : Ed. Quae, 2013", pp. 171-194.

Cirad-Agritrop : CD_P40 SOU 16668; BA_P40 SOU 5747 Dk : 570825

28

Genevey, R.-É. s., Pachauri, R. K.-É. s., Tubiana, L.-É. s., Biagiotti, I.-É. s., Jozan, R.-É. s., and Voituriez, T.-É. s. (2013)

Regards sur la terre 2013 : Réduire les inégalités : un enjeu de développement durable, Armand Colin, Paris. 384 p.

Regards sur la Terre décrypte la complexité des processus qui composent le développement durable et en révèle toute la richesse. La première partie dresse le bilan de l'année 2012 : retour sur les dates qui ont marqué l'avancée des connaissances et la construction de l'action dans les domaines du climat, de la biodiversité, des ressources naturelles, de la gouvernance, de l'énergie, de la santé ou du développement ; analyse des événements clés et des tendances émergentes, identification des acteurs majeurs, des enjeux et des perspectives. Le Dossier 2013 traite des relations entre l'accroissement des inégalités contemporaines et l'insoutenabilité de nos trajectoires de développement. Les inégalités sont-elles un obstacle au développement durable ? La réduction des inégalités est-elle un prérequis à un mode de développement plus soutenable ? Vingt ans après le Sommet de la Terre de Rio, les aspects sociaux du développement et de la croissance ont en effet pris une place prépondérante dans le débat public. La frontière historique entre les préoccupations présumées pour l'environnement des pays de l'OCDE, actuellement en crise, et le désir légitime de croissance des pays émergents en pleine expansion semble aujourd'hui s'être brouillée et les équilibres mondiaux profondément transformés. Sous l'effet de la crise économique, les écarts de revenus entre pays riches et pays en développement n'ont fait que diminuer, mais les inégalités au sein même des pays n'ont jamais été aussi fortes, avec des conséquences immédiates sur la santé, l'urbanisation, la biodiversité... Objet de préoccupation commune, nécessitant la mise en oeuvre de politiques novatrices à l'échelle internationale, la question de la réduction des inégalités est au cœur des objectifs d'un développement qui permette à chacun un niveau de vie convenable tout en préservant les besoins des générations futures. Fruit d'une coopération entre l'AFD (Agence française de développement), l'Iddri (Institut du développement durable et des relations internationales) et le TERI (The Energy and Resources Institute), Regards sur la Terre constitue un outil d'information et de compréhension indispensable. Sommaire : 20 ans après Rio, le développement durable s'universalise (Rémy Genevey, Laurence Tubiana, Rajendra K. Pachauri). A. Regards sur 2012 : bilan d'une année de développement durable. 1. 2012 mois par mois. 2. Tendances, acteurs, faits marquants : Les pays en développement face aux crises des pays développés (François-Xavier Bellocq) ; Économie verte : l'enjeu des fonds souverains (Emmanuel Guérin) ; Climat : ce que dit la science (Michel Colombier) ;

Rio+20 : un processus permanent ? (Alexis Bonnel) ; La croissance verte : entre notion et décision (Damien Demailly, Fabio Grazi) ; Les grands barrages en Afrique : choix énergétiques ou environnementaux ? (Sébastien Treyer, Nicolas Fornage, Jean-Noël Roulleau) ; Les pays émergents dans la course aux technologies vertes (Tancrède Voituriez, Joël Ruet) ; Quelle agriculture demain ? Négocier les priorités de la recherche agronomique internationale (Sébastien Treyer). B. Dossier 2013 : Réduire les inégalités : un enjeu de développement durable (Raphaël Jozan, Tancrède Voituriez). 1 - Inégalités : l'importance de la perspective historique (Pedro Ramos Pinto). Focus : Les formes et les causes de l'inégalité : au-delà de l'analyse de l'OCDE (Dean Baker, David Rosnick). 2 - La nouvelle prospérité des rentiers : la dynamique des inégalités dans un monde en croissance faible (Thomas Piketty). Focus : Aide publique au développement : la question des inégalités redevient d'actualité (Serge Tomasi). 3 - Concevoir les inégalités dans le monde : l'émergence d'une idée politique au XXe siècle (Vincent Bonnecase). Focus : Statistiques internationales relatives aux inégalités : constructions politiques et spatiales (Benoît Martin). 4 - Inégalités et croissance : l'émergence d'une idéologie globale entre 1990 et 2010 (François Bourguignon). Focus : Inégalités et sortie de crise (Raymond Torres, Stefan Kühn, Matthieu Charpe). 5 - L'égalité économique, un facteur indispensable pour préserver la biodiversité (Gregory M. Mikkelsen, Raphaël Billé, Gilles Kleitz). Focus : Conserver la biodiversité et réduire les inégalités : la gestion communautaire des ressources naturelles en Namibie (Renaud Lapeyre, Constance Corbier-Barthaux). 6 - Inégalités de revenus, inégalités en santé et progrès social (Sridhar Venkatapuram). Focus : Vers une protection sociale de santé universelle au Cambodge (Virginie Diaz Pedregal, Stéphanie Pamies-Sumner, David I. Levine, Ian Ramage). 7 - Les inégalités dans la moitié urbaine du monde (David Satterthwaite, Diana Mitlin). Focus : Les favelas, la ségrégation au cœur de la ville (Luiz Antonio Machado Da Silva). 8 - Comment tuer la taxe carbone avec l'argument d'équité, ou l'échec de la taxe Sarkozy (Jean-Charles Hourcade). Focus : Expérience suédoise de taxe sur le CO₂ et de réforme fiscale (Henrik Hammar, Thomas Sterner, Susanne Åkerfeldt). 9 - Les voies de la durabilité dans un monde en crise (Peter Utting). Focus : L'émergence des classes moyennes en Afrique subsaharienne (Pierre Jacquemot). 10 - La politique sociale du Brésil au XXI^e siècle (Barbosa Thiago Varanda, Oliveira Mayra Juruá). Focus : Afrique du Sud : l'échec de la gouvernance décentralisée (Thierry Giordano). 11 - Commerce en bas de la pyramide : repenser les stratégies (Erik Simanis). Focus : Femmes chinoises : victimes de la privatisation des services sociaux (Sarah Cook, Xiao-Yuan Dong). 12 - L'économie solidaire : l'émancipation en acte au défi du politique (Bruno Frère). Focus : Ekta Parishad, mouvement des sans-terre en Inde : des revendications aux alternatives locales solidaires (Emeline De Bouvier). 13 - Définir des objectifs de développement durable à l'horizon 2030 (Xue Lan, Jeffrey D. Sachs, Guido Schmidt-Traub, Laurence Tubiana). Focus : Définir des objectifs communs dans un contexte de méfiance multilatérale (Mark Hallé). (Adapté du résumé de l'éditeur). Diffusion : Armand Colin - 21 rue de Montparnasse - 75006 PARIS www.armand-colin.fr
Cirad-Agritrop : CD_P01 JAC 16385; BA_P01 JAC 5730 Dk : 567234

29

Clavel, D. (2014)

Knowledge and rural development : dialogue at the heart of innovation, Springer [Pays-Bas], Dordrecht. XVII-67 p.

Présentation de l'éditeur : Following the hunger riots in 2008, against a backdrop of the world environmental and economic crisis, the arrangements in place for international aid to developing countries, particularly in Africa, were seriously called into question. The permanent threat of famine from climate change and speculation has made food-crop agriculture a core concern. What type of rural development do we need to return to, how and with whom? Some African communities have already started answering these questions. They are proposing novel and productive, local or regional actions that are proving their worth. At the confluence of heretofore overlooked cultures, new development modes are seeing the light of day. The author describes some of these African initiatives that respect the identity of rural populations. These experiences illustrate an approach whereby technical innovation is no longer central, but fits into a more global system. Another type of development is taking shape. Dialogue, active participation of the communities involved and consideration of all types of local knowledge are its basic principles. Main contents: Acknowledgements. Foreword. I. Vulnerability and resilience of smallholder farms: Limiting the cultural risk. Powerlessness of international aid. Widening the agricultural issue. II. New partnerships for research and innovation: Research and sustainable development concepts. Developing stakeholder adaptability and empowerment. III. Multi stakeholder approaches in Africa and Brazil: Participatory practices in Africa. The UniCampa pilot project in Brazil. Case study analysis. Overview. IV. Development models at the crossroads of all knowledge. Conclusion. References

<http://dx.doi.org/10.1007/978-94-017-9124-3> Cirad-Agritrop : CD_E14 CLA 16964 Dk : 574048

30

Bessou, C., and Colomb, V. (2013)

Affichage environnemental des produits agricoles en France : quelle méthode pour quels objectifs ?

Affichage environnemental des produits agricoles en France : quelle méthode pour quels objectifs ?
Cahiers agricultures vol.22:n°2

Lors du Grenelle de l'environnement, l'accent a été porté dans le secteur agricole sur l'agro-écologie et la nécessité d'orienter les modes de consommation vers des produits respectueux de l'environnement. Ainsi, depuis juin 2011, une nouvelle certification volontaire a été mise en place par décret : l'agriculture à haute valeur environnementale (HVE). Cette certification a pour objectif d'harmoniser les démarches agro-environnementales existantes et repose sur un système semi-quantitatif d'évaluation des pratiques. C'est une démarche en trois niveaux d'engagements, où seul le niveau le plus exigeant autorise l'apposition du logo HVE sur les produits. En parallèle, depuis le 1 er juillet 2011, une expérimentation nationale sur l'affichage environnemental des produits de grande consommation a été lancée avec plusieurs dizaines d'entreprises et autant de projets d'affichage environnemental. L'analyse de cycle de vie (ACV) est la méthode préconisée dans ce cadre. L'objectif est d'utiliser les données d'inventaire d'ACV afin de produire des indicateurs pour l'affichage environnemental des produits agricoles. L'HVE, centrée sur les pratiques au niveau de l'exploitation agricole, et l'ACV, qui se concentre sur les impacts des filières, reposent sur deux approches bien distinctes d'analyse d'impacts environnementaux. Les informations apportées par chaque méthode peuvent s'avérer complémentaires dans le cadre de l'affichage environnemental. Cependant, les conditions pour le développement de l'ACV semblent plus favorables, étant donné que l'ACV est obligatoire tandis que l'HVE est volontaire. Ces démarches restent en construction avec encore de nombreuses interrogations méthodologiques qui pointent la difficulté à trouver un compromis entre efficacité pour la communication et rigueur scientifique. (Résumé d'auteur)

<http://dx.doi.org/10.1684/agr.2013.0612> Cirad-Agritrop : CD_PE1476; BA_PEBA764 Dk : 568850

Articles publiés dans une revue à facteur d'impact

31

Guillou, M., and Matheron, G. (2014)

The world's challenge : Feeding 9 billion people, Springer [Allemagne], Heidelberg. XV-226 p.

Présentation de l'éditeur : Is the world headed toward a major food crisis? After several decades of seeming indifference, public opinion is slowly awakening to the fact that a daunting task lies ahead. If a global population of 9 billion by 2050 is to be fed adequately, more food must be produced, and this in keeping with increasingly stringent standards of quality and with respect for the environment. Not to mention the land that must be set aside for the production of energy resources, industrial goods, carbon storage and the protection of biodiversity. To meet this challenge, societies must innovate, keep losses and waste in check, and reverse the current trend of excessive and imbalanced calorie intake. At the same time, the world must put an end to hunger and with it, the suffering of some one billion people. Researchers the world over have dedicated their life's work to finding viable solutions to these key issues on a global scale. In this work, the heads of two leading French agricultural research organisations, INRA and CIRAD, shed light on the issue in terms that are clear and accessible to the public at large. The reader will find a wealth of information, thought provoking insight and some surprising solutions. The world can avert a crisis, provided it makes a firm commitment to profound change, notably in the consumption and production habits of today's western societies. Contents: Acknowledgements. Introduction. 1 - Setting the stage: Science enters the equation. A closer look at the issue. Why nine billion? Food for all: two different scenarios. Agrimonde: the results. Les sons learned from the Agrimonde study: change is in order. 2 - Eat well, eat better: Changes at the root of nutritional imbalances. Getting to the root of profound changes. Overnutrition and health. Taking action: a how to. 3 - Reducing losses and waste at consumption, distribution and processing levels: The scope of the issue. Losses at different stages and technical solutions currently implemented. Change is in order. 4 - Reducing post-harvest losses in developing nations: Harvest-related losses: a reality in developed nations as well. Why post-harvest losses in developing countries matter. The challenge of quantifying post-harvest losses. Despite difficulties in quantifying losses, one thing is clear: post-harvest losses are significant. Post-harvest losses and when they occur. Next steps. Annex. 5 - Producing other goods: What is biomass? High expectations for energy. New possibilities for green chemistry. Meeting these new needs by choosing the right biomass. How these prospects change the hunger equation. 6 - Managing ecosystem services: Agriculture and ecosystem services.

Biodiversity's key role in ecological regulating services. Using and managing ecosystem services. 7 - Will there be enough land?: Agricultural land: a look at the current situation. The impact of climate change on agricultural production potential. Non-food uses for biomass: an excessive need for land? Economic, policy and social factors affecting land use conversion. 8 - The need to strive for productive yet ecological agriculture: Optimised productivity of arable land. Environmental degradation. Increased, improved production: a realistic goal? Intensive, capital-poor agriculture: the case of South-East Asia. Agricultural systems with productivity reserves. Is sub-Saharan agriculture in need of new development? Thinking and acting globally. 9 - Feeding the world starts with fighting poverty: Mapping hunger. The usual suspect: blaming malnutrition on a lack of available food. The link between food and poverty: common assumptions and misconceptions. Charting a course of action. 10 - Towards a global governance of food: Re-examining the food riots. We must step back from agriculture in order to understand it. Diets: a factor of future need. Reinvesting in agriculture: an urgent necessity. Fighting poverty. Regulation: rules as a safety net. The need for global governance of food security as a "public good". Dedicated agronomic research. Conclusion. Preventing catastrophe. References. Glossary
<http://dx.doi.org/10.1007/978-94-017-8569-3> Cirad-Agritrop : CD_E10 GUI 16875 Dk : 573770

32

Anh, D. T., Minh, N. N., Nghiêp, P. C., Hai, N. T., Doan, V. V., and Sautier, D. (2013)

Le développement d'une agriculture multifonctionnelle dans l'espace péri-urbain de Hanoï

Le développement d'une agriculture multifonctionnelle dans l'espace péri-urbain de Hanoï

Vietnam Journal of Science for Rural Development vol.7

Suite au rattachement de Ha Tay en 200B, la province de Hanoï possède plus de terres agricoles, mais leur vitesse de réduction est plus rapide. Les systèmes de production agricole durable dans l'agriculture périurbaine de Hanoï doivent être soutenus par les rôles multifonctionnels de l'agriculture: approvisionner la ville en aliments sûrs, créer des emplois, assurer des services environnementaux pour les zones urbaines tels que le tourisme et la ceinture verte, gérer l'eau et garantir sa consommation... Cependant, l'absence de gestion institutionnelle appropriée et le manque d'investissements logistiques font que les systèmes périurbains actuels ne sont pas durables. Les enquêtes quantitatives montrent que la durabilité des systèmes de production agricoles reste faible. L'article conclut que Hanoï devrait se doter de stratégies et politiques de développement de production et d'approvisionnement alimentaires durables, au travers d'investissements logistiques et d'une gestion de la qualité intégrée dans les chaînes de valeur. Il est nécessaire de donner la priorité au développement de circuits de distribution courts et de promouvoir l'émergence de nouveaux villages agricoles planifiés. Une planification régionale détaillée de l'agriculture est essentielle pour mieux comprendre les avantages et les inconvénients des différents types d'agriculture périurbaine qui coexistent à Hanoï aujourd'hui. (Résumé d'auteur)

Cirad-Agritrop Dk : 570732

Articles publiés dans une revue sans comité de lecture

8.2. Ressources naturelles et environnement

33

Camberlin, P., Boyard-Micheau, J., Philippon, N., Baron, C., Leclerc, C., and Mwongera, C. N. (2014)

Climatic gradients along the windward slopes of Mount Kenya and their implication for crop risks. Part 1: Climate variability

Climatic gradients along the windward slopes of Mount Kenya and their implication for crop risks. Part 1: Climate variability

International Journal of Climatology vol.34:n°7

In tropical mountains, the way topographical gradients translate in terms of intra-seasonal and interannual climate variability (especially rainfall and evapotranspiration) is relatively unknown, yet it is an important issue for agriculture and food security. The eastern slopes of Mount Kenya, in East Africa, with their wide range of agro-ecological conditions, are appropriate for the study of these aspects. Daily (monthly) rainfall data from 11 (24) stations at different elevations and exposures are collected for the period 1961-2006. For the elevation belts suitable for farming and agro-pastoral activities, mostly below 2000 m, it is found that not all rainfall characteristics co-vary with altitude. Four distinct behaviours are revealed: (1) Parameters which show a relatively regular increase/decrease with elevation. This is the case for the duration of the two rainy seasons found across the region, and the mean onset and cessation dates, (2) Parameters which show a relatively uniform pattern throughout the region, with little differences both horizontally and vertically. This applies to the interannual variability of the October-December seasonal rains, which are quite homogeneously

modulated by Indian Ocean sea-surface temperatures (SSTs), (3) Parameters markedly influenced by exposure. This applies to daily rainfall intensities, which peak along the southeast-facing slopes, whatever the altitude. The frequency of rainy days shows both a vertical gradient and some influence of exposure, (4) Parameters which show very weak spatial coherence, or pronounced vertical discontinuities. This is obvious for the cessation date of the March-May rains, whose poorly organized interannual variability contrasts with that of the onset. Variables involved in potential evapotranspiration (ET0) computation display either a strong (maximum temperature) or a weak (global radiation) vertical coherence, reflecting the existence/absence of an elevation control on the mean distribution of these variables. However, the interannual variations of global radiation have the strongest influence on those of ET0. (Résumé d'auteur)

<http://dx.doi.org/10.1002/joc.3427> Cirad-Agritrop Dk : 573490

Articles publiés dans une revue à facteur d'impact

34

Alle, U. C., Vissoh, P. V., Guibert, H., Agbossou, E. K., and Afouda, A. (2013)

Relation entre perceptions paysanne de la variabilité et observations climatiques au Sud-Bénin

Relation entre perceptions paysanne de la variabilité et observations climatiques au Sud-Bénin

VertigO vol.13:n°3

L'étude a pour objectif d'analyser les perceptions paysannes de la variabilité climatique et leur pertinence par rapport aux observations climatiques. À cet effet, elle a comparé des données climatiques de 14 stations et des perceptions paysannes de la variabilité climatique recueillies à partir d'une enquête auprès de 201 chefs d'exploitation (CE) agricole répartis sur 67 villages au sud-Bénin. L'enquête était constituée d'entretiens collectifs et individuels, à questionnaires ouverts, semi-ouverts et fermés. Les CE sont davantage marqués par la dégradation de la qualité des saisons des pluies observée entre 1951-1970 et 1971-1990, en l'occurrence la modification des dates de début et de fin des saisons des pluies, la recrudescence des séquences sèches, la diminution du nombre de jours pluvieux et le déficit pluviométrique, que par la relative récente reprise des précipitations au cours des années 1990 et 2000 sur la région d'étude. Toutefois, le changement d'échelle, de régionale à locale, réduit sensiblement l'écart entre les perceptions paysannes et les observations climatiques. Les CE citent également la baisse des températures et l'augmentation de la fréquence des vents violents pendant les saisons pluvieuses. Ces perceptions sont contraires aux observations climatiques et suggèrent des investigations plus approfondies pour mieux comprendre ces divergences. Face à la variabilité climatique, les CE ont développé des mesures d'adaptation qui globalement traduisent leur perception. Ceci ouvre des perspectives pour l'élaboration de stratégies d'adaptation avec une forte chance d'attirer l'intérêt des producteurs. (Résumé d'auteur)

<http://vertigo.revues.org/14361> Cirad-Agritrop Dk : 572417

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

35

Chazarin, F., Locatelli, B., and Garay-Rodríguez, M. (2014)

Mitigación en la selva, adaptación en la sierra y la costa: ¿Oportunidades perdidas de sinergias frente al cambio climático en Perú?

Mitigación en la selva, adaptación en la sierra y la costa: ¿Oportunidades perdidas de sinergias frente al cambio climático en Perú?

Ambiente y Desarrollo vol.18:n°35

Les réponses au changement climatique comprennent l'adaptation, qui porte sur les impacts de la variabilité et de l'atténuation, qui vise à réduire les émissions de gaz à effet de serre dans le changement climatique cause de l'atmosphère climatique. Souvent, les deux réponses sont mises en oeuvre séparément, mais il y aurait beaucoup de potentiel pour développer des synergies entre elles, en particulier dans le secteur forestier, l'agriculture et l'utilisation des terres. Cette étude examine les possibilités de relier les mesures d'adaptation à l'atténuation, et vice-versa, à partir d'études de cas au Pérou. Ont été examinés et cartographié les projets et la recherche scientifique sur l'adaptation et l'atténuation du changement climatique sur les forêts, l'utilisation des terres et de l'agriculture au Pérou. Il a été constaté que la plupart des initiatives et des recherches liées à l'adaptation sont situées dans les hauts plateaux et les régions côtières, alors que l'atténuation se trouve dans la jungle. La séparation nette entre les zones géographiques pour les initiatives d'adaptation et d'atténuation suggère une perte de possibilités de synergies entre les deux stratégies pour faire face au changement climatique. (Résumé d'auteur)

<http://revistas.javeriana.edu.co/index.php/ambienteydesarrollo/article/view/11812/9684> Cirad-Agritrop Dk : 574623

Autres articles

36

Dumas, P., Hallegatte, S., Quintana-Segui, P., and Martin, E. (2013)

The influence of climate change on flood risks in France-first estimates and uncertainty analysis

The influence of climate change on flood risks in France-first estimates and uncertainty analysis

Natural Hazards and Earth System Sciences vol.13

This paper proposes a methodology to project the possible evolution of river flood damages due to climate change, and applies it to mainland France. Its main contributions are (i) to demonstrate a methodology to investigate the full causal chain from global climate change to local economic flood losses; (ii) to show that future flood losses may change in a very significant manner over France; (iii) to show that a very large uncertainty arises from the climate downscaling technique, since two techniques with comparable skills at reproducing reference river flows give very different estimates of future flows, and thus of future local losses. The main conclusion is thus that estimating future flood losses is still out of reach, especially at local scale, but that future national-scale losses may change significantly over this century, requiring policy changes in terms of risk management and land-use planning. (Résumé d'auteur)

<http://dx.doi.org/10.5194/nhess-13-809-2013> Cirad-Agritrop Dk : 570655

Articles publiés dans une revue à facteur d'impact

37

Santos, F. D., Stigter, T. Y., Faysse, N., and Lourenço, T. C. (2014)

Impacts and adaptation to climate change in the Mediterranean coastal areas: The CIRCLE-MED initiative

Impacts and adaptation to climate change in the Mediterranean coastal areas: The CIRCLE-MED initiative

Regional Environmental Change vol.14:n°1, suppl.

<http://dx.doi.org/10.1007/s10113-013-0551-2> Cirad-Agritrop Dk : 572233Articles publiés dans une revue à facteur d'impact

38

Santikayasa, P., Babel, M. S., Shrestha, S., Jourdain, D., and Clemente, R. S. (2014)

Evaluation of water use sustainability under future climate and irrigation management scenarios in Citarum River Basin, Indonesia

Evaluation of water use sustainability under future climate and irrigation management scenarios in Citarum River Basin, Indonesia

International journal of sustainable development and world ecology vol.21:n°2

Sustainable water use in agriculture faces several challenges due to future climate change, increasing population, and higher living standards. Adapting to possible future changes in climate and sustaining the use of water are some of the challenges that face future agricultural water management. In this research, the sustainability of irrigation water use was assessed by performance criteria that consider the effects of climate change and adaption management on irrigation. The model, built using the Water Evaluation and Planning (WEAP) system, is calibrated using the stream flow and the requirement of water for irrigation. The model was used to examine two future climate projections (A2 and B2), for time periods until 2099, and for four scenarios: (1) an increase in the irrigated area, (2) an increase in crop intensity, (3) a change in the crop pattern, and (4) a combination of increased irrigation area and increased crop intensity. Results show water supply is projected to increase by about 85 and 60% (relative to the historical period) in A2 and B2 climate scenarios, respectively, by the end of the century. The requirement for irrigation water will decrease in the future, relative to the historical period. The sustainability index will also decrease in the future, relative to the historical period. Relative to the baseline scenario, increasing the irrigated area is more sustainable than increasing the crop intensity or combining increased crop intensity with increased area under irrigation. Increasing the irrigated area is more amenable to adaption to possible future climate changes. (Résumé d'auteur)

<http://dx.doi.org/10.1080/13504509.2014.884023> Cirad-Agritrop Dk : 573907

Articles publiés dans une revue à facteur d'impact

39

Harvey, C. A., Chacon, M., Donatti, C. I., Garen, E., Hannah, L., Andrade, A., Bede, L., Brown, D., Calle, A., Chará, J., Clement, C., Gray, E., Hoang, M. H., Minang, P., Rodriguez, A. M., Seeberg-Elverfeldt, C., Semroc, B., Shames, S., Smukler, S., Somarriba, E., Torquebiau, E., Van Etten, J., and Wollenberg, E. (2014)

Climate-smart landscapes: Opportunities and challenges for integrating adaptation and mitigation in tropical agriculture

Climate-smart landscapes: Opportunities and challenges for integrating adaptation and mitigation in tropical agriculture

Conservation letters vol.7:n°2

Addressing the global challenges of climate change, food security, and poverty alleviation requires enhancing the adaptive capacity and mitigation potential of agricultural landscapes across the tropics. However, adaptation and mitigation activities tend to be approached separately due to a variety of technical, political, financial, and socioeconomic constraints. Here, we demonstrate that many tropical agricultural systems can provide both mitigation and adaptation benefits if they are designed and managed appropriately and if the larger landscape context is considered. Many of the activities needed for adaptation and mitigation in tropical agricultural landscapes are the same needed for sustainable agriculture more generally, but thinking at the landscape scale opens a new dimension for achieving synergies. Intentional integration of adaptation and mitigation activities in agricultural landscapes offers significant benefits that go beyond the scope of climate change to food security, biodiversity conservation, and poverty alleviation. However, achieving these objectives will require transformative changes in current policies, institutional arrangements, and funding mechanisms to foster broad-scale adoption of climate-smart approaches in agricultural landscapes. (Résumé d'auteur)

<http://dx.doi.org/10.1111/conl.12066> Cirad-Agritrop Dk : 573204

Articles publiés dans une revue à facteur d'impact

40

Alle, U. C., Afouda, A., Agbossou, E. K., and Guibert, H. (2013)

Evolution des descripteurs intrasaisonnières des saisons pluvieuses au sud-Bénin entre 1951 et 2010

Evolution des descripteurs intrasaisonnières des saisons pluvieuses au sud-Bénin entre 1951 et 2010

American Journal of Scientific Research vol.94

Cette étude a analysé l'évolution des descripteurs intrasaisonnières des saisons pluvieuses au sud-Bénin entre 1951 et 2010. A cet effet, les enregistrements pluviométriques journaliers de 14 stations ont été utilisés. La période d'étude a été scindée en trois sous-périodes de 20 ans : 1951-1970, 1971-1990 et 1991-2010. Les tendances entre les sous-périodes montrent que la sous-période intermédiaire (1971-1990) est la plus sèche. Après 1990, on note un retour de conditions plus humides, mais cette dernière sous-période (1991-2010) demeure déficitaire au regard de la sous-période la plus humide (1951-1970). Toutefois, la première et la deuxième saison des pluies ne sont pas affectées de la même manière par les forçages atmosphériques. Après 1990, alors que la qualité de la deuxième saison des pluies redevenait comparable à celle de 1951-1970, la première saison des pluies est restée précaire, comparable à celle de 1971-1990. En outre, après 1970, la première saison des pluies a raccourci du fait de son retard, alors que la deuxième saison des pluies s'est allongée due à la précocité de son démarrage. Ces évolutions dans la durée des saisons et dans leur qualité ouvrent des questionnements importants dans le cadre de l'adaptation des stratégies agricoles aux aléas climatiques. (Résumé d'auteur)

Cirad-Agritrop Dk : 572514

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

41

Lodoun, T., Giannini, A., Traoré, P. S., Some, L., Sanon, M., Vaksmann, M., and Millogo Rasolodimby, J. (2013)

Changes in seasonal descriptors of precipitation in Burkina Faso associated with late 20th century drought and recovery in West Africa

Changes in seasonal descriptors of precipitation in Burkina Faso associated with late 20th century drought and recovery in West Africa

Environmental Development vol.5

Daily rainfall records of 39 stations spanning the different agro-climatic zones of Burkina Faso were analyzed to describe the evolution of five seasonal rainfall descriptors over time. The period from 1941 to 2000, including the two most contrasted periods in the recent history of the Sahelian climate, i.e. the

wet decades (1941-1970) and the dry decades (1971-2000), were considered. It was found that certain seasonal descriptors-namely total seasonal rainfall, number of rain-days and cessation dates of the rainy season-when aggregated into annual and national means manifested almost the same evolution pattern; while others, notably average rainfall per rain-day and onset date of the growing period, showed different patterns of evolution. It was concluded that the recent reduction in seasonal precipitation amount was related to a reduced number of rain-days in August and September, with precocious cessation of the rainy season as a consequence. However, all the seasonal descriptors showed recovery trends since the end of the 1980s, with the mean rainfall per rain-day, exhibiting the steadiest trend. But, the descriptors were more volatile during that recovery time according to the upward trends in their interannual variability. Importantly, the links between the seasonal descriptors and two sea surface temperature indexes were discussed in light of climate change impacts on rain-fed agriculture, the main source of food for the population of Burkina Faso. The results should be incorporated in alleviation strategies of climate change impacts in the Sahel region. (Résumé d'auteur)
<http://dx.doi.org/10.1016/j.envdev.2012.11.010> Cirad-Agritrop Dk : 567189

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

42

Gabrielle, B., Gagnaire, N., Massad, R. S., Dufossé, K., and Bessou, C. (2014)

Environmental assessment of biofuel pathways in Ile de France based on ecosystem modeling

Environmental assessment of biofuel pathways in Ile de France based on ecosystem modeling

Bioresource technology vol.152

The objective of the work reported here was to reduce the uncertainty on the greenhouse gas balances of biofuels using agro-ecosystem modeling at a high resolution over the Ile-de-France region in Northern France. The emissions simulated during the feedstock production stage were input to a life-cycle assessment of candidate biofuel pathways: bioethanol from wheat, sugar-beet and miscanthus, and biodiesel from oilseed rape. Compared to the widely-used methodology based on fixed emission factors, ecosystem modeling lead to 55-70% lower estimates for N₂O emissions, emphasizing the importance of regional factors. The lifecycle GHG emissions of first-generation biofuels were 50-70% lower than fossil-based equivalents, and 85% lower for cellulosic ethanol. When including indirect land-use change effects, GHG savings became marginal for biodiesel and wheat ethanol, but were positive due to direct effects for cellulosic ethanol. (Résumé d'auteur)
<http://dx.doi.org/10.1016/j.biortech.2013.10.104> Cirad-Agritrop Dk : 573039

Articles publiés dans une revue à facteur d'impact

43

Clavel, D., Feintrenie, L., Jamin, J.-Y., Torquebiau, E., and Bazile, D. (2014)

Défis de gestion et d'usage des ressources naturelles. In "Agricultures familiales et mondes à venir. - Versailles : Ed. Quae, 2014", pp. 219-234.

Cirad-Agritrop : BA_E20 SOU 5834 Dk : 572865

44

Philippon, N., Martiny, N., Camberlin, P., Hoffman, M. T., and Gond, V. (2014)

Timing and patterns of the ENSO signal in Africa over the last 30 years: Insights from normalized difference vegetation index data

Timing and patterns of the ENSO signal in Africa over the last 30 years: Insights from normalized difference vegetation index data

Journal of Climate vol.27:n°7

A more complete picture of the timing and patterns of the ENSO signal during the seasonal cycle for the whole of Africa over the three last decades is provided using the normalized difference vegetation index (NDVI). Indeed, NDVI has a higher spatial resolution and is more frequently updated than in situ climate databases, and highlights the impact of ENSO on vegetation dynamics as a combined result of ENSO on rainfall, solar radiation, and temperature. The month-by-month NDVI-Niño-3.4 correlation patterns evolve as follows. From July to September, negative correlations are observed over the Sahel, the Gulf of Guinea coast, and regions from the northern Democratic Republic of Congo to Ethiopia. However, they are not uniform in space and are moderate (~0.3). Conversely, positive correlations are recorded over the winter rainfall region of South Africa. In October-November, negative correlations over Ethiopia, Sudan, and Uganda strengthen while positive correlations emerge in the Horn of Africa and in the southeast coast of South Africa. By December with the settlement of the ITCZ south of the equator, positive correlations over the Horn of Africa spread southward and westward while negative correlations appear over Mozambique, Zimbabwe, and South Africa. This

pattern strengthens and a dipole at 18°S is well established in February-March with reduced (enhanced) greenness during ENSO years south (north) of 18°S. At the same time, at ~2°N negative correlations spread northward. Last, from April to June negative correlations south of 18°S spread to the north (to 10°S) and to the east (to the south of Tanzania). (Résumé d'auteur)

<http://dx.doi.org/10.1175/JCLI-D-13-00365.1> Cirad-Agritrop Dk : 573015

Articles publiés dans une revue à facteur d'impact

45

Leroux, L., Oszwald, J., Ngounou Ngatcha, B., Sebag, D., Penven, M.-J., and Servat, E. (2013)

Le bassin versant du Mayo-Tsanaga (Nord Cameroun) : un bassin versant expérimental pour une compréhension des relations Homme/Milieu

Le bassin versant du Mayo-Tsanaga (Nord Cameroun) : un bassin versant expérimental pour une compréhension des relations Homme/Milieu

Revue Française de Photogrammétrie et de Télédétection n°202

Depuis les trente dernières années, de nombreuses études scientifiques s'intéressent aux dynamiques hydrologiques relevées dans le bassin versant du Lac Tchad. En effet, ce bassin versant a été, et est encore, une zone emblématique des impacts du changement climatique sur la ressource en eau en région sub-saharienne. La gestion de cette ressource est d'autant plus complexe que ce bassin versant se partage entre le Tchad, le Niger, le Nigéria et le Cameroun. Ce dernier, bien que important pour le fonctionnement hydrique du lac Tchad, est encore trop peu étudié par la communauté scientifique. Nous nous proposons donc de travailler sur le bassin versant du Mayo-Tsanaga, situé au Nord Cameroun et connecté au fleuve Logone, affluent du fleuve Chari et principal contributeur au bilan hydrique du lac Tchad. Quelques chercheurs de l'ORSTOM (Office de la Recherche Scientifique et Technique Outre-Mer) ont déjà travaillé sur ce bassin versant dans les années 1970, mais très peu de travaux ont été mis en place ces vingt-cinq dernières années sur celui-ci. De ce fait, il est primordial aujourd'hui, afin de pouvoir relancer une étude du bassin versant du Mayo-Tsanaga par instrumentation, de remettre à jour nos connaissances géomorphologiques, hydrographiques et d'occupation du sol. Pour ce faire, nous avons recours à des données récentes et plus précises (MNT Aster, images satellites Landsat TM et ETM+) afin de suivre les dynamiques Hommes / milieux ayant cours depuis les 25 dernières années. Ce travail montre une mutation et une organisation complexe des pratiques, en relation notamment avec la géomorphologie et la pédologie du bassin versant du Mayo-Tsanaga. (Résumé d'auteur)

Cirad-Agritrop Dk : 572465

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

46

Leroux, L., Jolivot, A., Bégué, A., Lo Seen, D., and Zoungrana, B. (2014)

How reliable is the MODIS land cover product for crop mapping Sub-Saharan agricultural landscapes?

How reliable is the MODIS land cover product for crop mapping Sub-Saharan agricultural landscapes? Remote sensing vol.6:n°9

Accurate cropland maps at the global and local scales are crucial for scientists, government and nongovernment agencies, farmers and other stakeholders, particularly in food-insecure regions, such as Sub-Saharan Africa. In this study, we aim to qualify the crop classes of the MODIS Land Cover Product (LCP) in Sub-Saharan Africa using FAO (Food and Agricultural Organisation) and AGRHYMET (AGRiculture, Hydrology and METeorology) statistical data of agriculture and a sample of 55 very-high-resolution images. In terms of cropland acreage and dynamics, we found that the correlation between the statistical data and MODIS LCP decreases when we localize the spatial scale (from $R^2 = 0.86$ *** at the national scale to $R^2 = 0.26$ *** at two levels below the national scale). In terms of the cropland spatial distribution, our findings indicate a strong relationship between the user accuracy and the fragmentation of the agricultural landscape, as measured by the MODIS LCP; the accuracy decreases as the crop fraction increases. In addition, thanks to the Pareto boundary method, we were able to isolate and quantify the part of the MODIS classification error that could be directly linked to the performance of the adopted classification algorithm. Finally, based on these results, (i) a regional map of the MODIS LCP user accuracy estimates for cropland classes was produced for the entire Sub-Saharan region; this map presents a better accuracy in the western part of the region (43%-70%) compared to the eastern part (17%-43%); (ii) Theoretical user and producer accuracies for a given set of spatial resolutions were provided; the simulated future Sentinel-2 system would provide theoretical 99% user and producer accuracies given the landscape pattern of the region. (Résumé d'auteur)

<http://dx.doi.org/10.3390/rs6098541> Cirad-Agritrop Dk : 573919
 Articles publiés dans une revue à facteur d'impact

47

Vintrou, E., Ienco, D., Bégué, A., and Teisseire, M. (2013)

Data mining, a promising tool for large-area cropland mapping

Data mining, a promising tool for large-area cropland mapping

IEEE Journal of selected topics in applied earth observations and remote sensing vol.6:n°5

The northern fringe of sub-Saharan Africa is a region that is considered to be particularly vulnerable to climate variability and change, and it is a location in which food security remains a major challenge. To address these issues, it is essential to develop global data sets of the geographic distribution of agricultural land use. The objectives of this study were to test an original data mining approach for classifying and mapping the cropped land in West Africa using coarse-resolution imagery and to compare the classification results with those obtained from a classic ISODATA approach. The data mining approach is able to handle large volumes of data and is based on different descriptors (65) of the land use, including the spatial and temporal satellite-derived metrics of 12 MODIS NDVI 16-day composite images and the static attributes taken from field surveys. The classic ISODATA method showed that 68.3% of pixels from a SPOT reference map were correctly classified in three validation sites versus 57.8% for the data mining approach. Validation by field observations showed equivalent results for both methods with an F-score of 0.72. The results of this study demonstrated the relevance of the use of data-mining tools for large-area monitoring. (Résumé d'auteur)

<http://dx.doi.org/10.1109/JSTARS.2013.2238507> Cirad-Agritrop Dk : 571503

Articles publiés dans une revue à facteur d'impact

48

Yuan, W., Cai, W., Xia, J., Chen, J., Liu, S., Dong, W., Merbold, L., Law, B., Arain, M. H., Beringer, J., Bernhofer, C., Black, A., Blanken, P. D., Cescatti, A., Chen, Y., François, L., Gianelle, D., Janssens, I. A., Jung, M., Kato, T., Kiely, G., Liu, D., Marcolla, B., Montagnani, L., Raschi, A., Rousard, O., Varlagin, A., and Wohlfahrt, G. (2014)

Global comparison of light use efficiency models for simulating terrestrial vegetation gross primary production based on the LaThuile database

Global comparison of light use efficiency models for simulating terrestrial vegetation gross primary production based on the LaThuile database

Agricultural and forest meteorology vol.192-193

Simulating gross primary productivity (GPP) of terrestrial ecosystems has been a major challenge in quantifying the global carbon cycle. Many different light use efficiency (LUE) models have been developed recently, but our understanding of the relative merits of different models remains limited. Using CO₂flux measurements from multiple eddy covariance sites, we here compared and assessed major algorithms and performance of seven LUE models (CASA, CFix, CFlux, EC-LUE, MODIS, VPM and VPRM). Comparison between simulated GPP and estimated GPP from flux measurements showed that model performance differed substantially among ecosystem types. In general, most models performed better in capturing the temporal changes and magnitude of GPP in deciduous broadleaf forests and mixed forests than in evergreen broadleaf forests and shrublands. Six of the seven LUE models significantly underestimated GPP during cloudy days because the impacts of diffuse radiation on light use efficiency were ignored in the models. CFlux and EC-LUE exhibited the lowest root mean square error among all models at 80% and 75% of the sites, respectively. Moreover, these two models showed better performance than others in simulating interannual variability of GPP. Two pairwise comparisons revealed that the seven models differed substantially in algorithms describing the environmental regulations, particularly water stress, on GPP. This analysis highlights the need to improve representation of the impacts of diffuse radiation and water stress in the LUE models. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.agrformet.2014.03.007> Cirad-Agritrop Dk : 573164

Articles publiés dans une revue à facteur d'impact

8.2.1. Services environnementaux et écosystémiques, carbone, biomasse

49

Marichal, R., Grimaldi, M., Feijoo, A., Oszwald, J., Praxedes, C., Ruiz Cobo, D. H., Del Pilar Hurtado, M., Desjardins, T., Lopes Da Silva, M. J., Da Silva Costa, L. G., Souza Miranda, I., Delgado Oliveira, M. N., Brown, G. G., Tséloouiko, S., Martins, M. B., Decaëns, T., Velasquez, E., and Lavelle, P. (2014) **Soil macroinvertebrate communities and ecosystem services in deforested landscapes of Amazonia**

Soil macroinvertebrate communities and ecosystem services in deforested landscapes of Amazonia
Applied soil ecology vol.83 2012-08-06/2012-08-10

Land use changes in the Amazon region strongly impact soil macroinvertebrate communities, which are recognized as major drivers of soil functions (Lavelle et al., 2006). To explore these relations, we tested the hypotheses that (i) soil macrofauna communities respond to landscape changes and (ii) soil macrofauna and ecosystem services are linked. We conducted a survey of macrofauna communities and indicators of ecosystem services at 270 sites in southern Colombia (department of Caquetá) and northern Brazil (state of Pará), two areas of the Amazon where family agriculture dominates. Sites represented a variety of land use types: forests, fallows, annual or perennial crops, and pastures. At each site we assessed soil macroinvertebrate density (18 taxonomic units) and the following ecosystem service indicators: soil and aboveground biomass carbon stock; water infiltration rate; aeration, drainage and water storage capacities based on pore-size distribution; soil chemical fertility; and soil aggregation. Significant covariation was observed between macrofauna communities and landscape metric data (co-inertia analysis: $RV = 0.30$, $p < 0.01$, Monte Carlo test) and between macrofauna communities and ecosystem service indicators (co-inertia analysis: $RV = 0.35$, $p < 0.01$, Monte Carlo test). Points located in pastures within 100 m of forest had greater macrofauna density and diversity than those located in pastures with no forest within 100 m (Wilcoxon rank sum test, $p < 0.01$). Total macroinvertebrate density was significantly correlated with macroporosity ($r^2 = 0.42$, $p < 0.01$), as was the density of specific taxonomic groups: Chilopoda ($r^2 = 0.43$, $p < 0.01$), Isoptera ($r^2 = 0.30$, $p < 0.01$), Diplopoda ($r^2 = 0.31$, $p < 0.01$), and Formicidae ($r^2 = 0.13$, $p < 0.01$). Total macroinvertebrate density was also significantly correlated with available soil water ($r^2 = 0.38$, $p < 0.01$) as well as other soil-service indicators (but with $r^2 < 0.10$). Results demonstrate that landscape dynamics and composition affect soil macrofauna communities, and that soil macrofauna density is significantly correlated with soil services in deforested Amazonia, indicating that soil macrofauna have an engineering and/or indicator function. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.apsoil.2014.05.006> Cirad-Agritrop Dk : 574003

Articles publiés dans une revue à facteur d'impact

50

Rapidel, B., and Le Coq, J.-F. (2014)

Ecosystem services. In "Achieving sustainability: Visions, principles, and practices / by Debra Rowe (Ed.). - Detroit : Macmillan Reference, 2014. - ISBN 978-0028662015", pp. 260-267.

Cirad-Agritrop : CD_E14 ROW 16793A Dk : 573306

51

Hrabanski, M. (2014)

Instrument de marché et biodiversité

Instrument de marché et biodiversité

CERISCOPE

<http://ceriscope.sciences-po.fr/environnement/content/part4/instrument-de-marche-et-biodiversite>

Cirad-Agritrop Dk : 574884

Autres articles

52

Hrabanski, M., Bidaud, C., Le Coq, J.-F., and Mérat, P. (2013)

Environmental NGOs, policy entrepreneurs of market-based instruments for ecosystem services? A comparison of Costa Rica, Madagascar and France

Environmental NGOs, policy entrepreneurs of market-based instruments for ecosystem services? A comparison of Costa Rica, Madagascar and France

Forest policy and economics vol.37

Market based instruments for ecosystem services have become the norm since the Millennium Ecosystem Assessment advanced the concept of "ecosystem services" as an international reference in global governance. In this way, market based instruments for ecosystem services have increasingly been implemented within nation States. In this paper we analyze the role of environmental

nongovernmental organizations (NGOs) in spreading market based instruments for ecosystem services. We put forward the hypothesis that: when a State cannot adequately defend its political and economic sovereignty to produce its own public policies, then the environmental NGOs are strong policy entrepreneurs, that are able to diffuse standards and policy instruments. When a State is more politically and economically capable, the role of environmental NGOs as policy entrepreneurs is more limited. To test this hypothesis, we analyze the diffusion of market based instruments for ecosystem services in three contrasted countries regarding State and NGOs' respective strength: Costa Rica, Madagascar and France. A comparison and analysis of the dissemination of the market based instruments for ecosystem services in different countries therefore seems highly relevant for analyzing such transfers of international standards and policy instruments. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.forpol.2013.09.001> Cirad-Agritrop Dk : 571314

Articles publiés dans une revue à facteur d'impact

53

Bidaud, C., Mérat, P., Andriamahefazafy, F., Serpantié, G., Cahen-Fourot, L., and Toillier, A. (2013) **Institutional and historical analysis of payments for ecosystem services in Madagascar.** In "Governing the provision of ecosystem services. - Dordrecht : Springer [Pays-Bas], 2013", pp. 207-233.

http://dx.doi.org/10.1007/978-94-007-5176-7_11 Cirad-Agritrop : CD_P01 MUR 16272 Dk : 568636

54

Karsenty, A., and Ezzine de Blas, D. (2014)

Du mésusage des métaphores. Les paiements pour services environnementaux sont-ils des instruments de marchandisation de la nature ? In "L'instrumentation de l'action publique / Ch. Halpern ; P. Lascoumes ; P. Le Galès (Eds). - Paris : Presses de Sciences Po, 2014. - ISBN 978-2-7246-1456-5", pp. 161-189.

Les paiements pour services environnementaux (PSE) sont fréquemment présentés comme des instruments " basés sur le marché " au motif qu'ils modifient les incitations, même si le recours à de véritables marchés est exceptionnel. Si sur un marché s'échangent avant tout des droits de propriété, on peut montrer que ce n'est pas le cas avec la plupart des PSE, dans lesquels des droits d'usage sont suspendus contractuellement. L'usage métaphorique du concept de marché sert surtout à disqualifier la réglementation. (Résumé d'auteur)

Cirad-Agritrop Dk : 572390

55

Hrabanski, M. (2013)

Les experts scientifiques français dans le Millennium Ecosystem Assessment (2001-2005) : les raisons de leur absence

Les experts scientifiques français dans le Millennium Ecosystem Assessment (2001-2005) : les raisons de leur absence

Natures sciences sociétés vol.21:n°2

Entre 2001 et 2005, quelque 1 360 experts mobilisés dans le Millennium Ecosystem Assessment (MA) ont fourni, à partir d'une évaluation scientifique, un rapport destiné aux décideurs politiques. Depuis la parution du MA en 2005, une notion très peu utilisée comme celle de service écosystémique (SE) est ainsi passée, en l'espace de quelques années, d'une position de confinement dans des milieux scientifiques restreints (biologie et écologie de la conservation), à une position centrale dans les analyses et la formulation de problématiques environnementales. La notion est toutefois apparue tardivement en France. Notre article contribue à mieux comprendre le désintérêt français pour la notion de SE avant la parution du MA. Les experts scientifiques français, quel que soit leur statut (chercheur, maître de conférences, professeur) ou leur discipline (écologie, biologie, économie, etc.) ne se sont pas impliqués dans le MA, alors que quelques années avant le MA, lors du Global Biodiversity Assessment (1993-1995), le précédent exercice d'évaluation internationale de la biodiversité, ils s'étaient au contraire fortement mobilisés. Pour expliquer ce désintérêt, l'article analyse le rôle des ministères de la Recherche et de l'Environnement, et les clivages structurels entre le monde de la recherche d'un côté et le monde politique de l'autre. En outre, l'enquête montre que la culture professionnelle des scientifiques français et leurs intérêts stratégiques ne les poussent pas à s'investir réellement dans ce type d'exercice. (Résumé d'auteur)

<http://dx.doi.org/10.1051/nss/2013095> Cirad-Agritrop Dk : 571384

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

56

Hrabanski, M., and Bidaud, C. (2014)

Circulation d'une norme internationale d'action publique et recomposition de l'Etat : analyse comparée des "services écosystémiques" à Madagascar et en France

Circulation d'une norme internationale d'action publique et recomposition de l'Etat : analyse comparée des "services écosystémiques" à Madagascar et en France

Revue Internationale de Politique Comparée vol.21:n°3

Née dans l'arène scientifique anglo-saxonne puis mise à l'agenda politique international via, notamment, l'exercice d'expertise internationale du Millennium Ecosystem Assessment, la notion de service écosystémique est depuis devenue une référence de politique publique dans les politiques internationales et nationales de conservation. La communication se propose de comparer la réception de cette notion et des instruments qui s'en réclament dans un pays développé, souvent présenté comme un Etat particulièrement interventionniste, la France, et un pays en développement, dont le PIB par habitant est un des plus bas au monde, Madagascar. En mobilisant l'analyse par les policy transfer studies (PTS), la communication interroge le rôle des Etats dans les transferts de politiques publiques internationales. La circulation des normes internationales questionne la souveraineté des Etats et leurs capacités à concevoir et mettre en oeuvre leurs politiques environnementales. Les transferts sont plus ou moins volontaires, ce qui par conséquent fait de l'environnement une question particulièrement politisée. La communication s'intéresse également aux différents acteurs qui interviennent dans la réception d'une norme internationale de politique publique dans un pays en développement et un pays développé et analyse ainsi les dynamiques de politisation différencierées de ces acteurs. (Résumé d'auteur)

<http://www.cairn.info/revue-internationale-de-politique-comparee.htm> Cirad-Agritrop Dk : 574934

Autres articles

57

Pesche, D., Oubenal, M., Vandevelde, J.-C., and Hrabanski, M. (2014)

Le "consensus d'Antalya" : les avancées de la Plateforme intergouvernementale scientifique et politique sur la biodiversité et les services écosystémiques (IPBES)

Le "consensus d'Antalya" : les avancées de la Plateforme intergouvernementale scientifique et politique sur la biodiversité et les services écosystémiques (IPBES)

Natures sciences sociétés vol.22:n°3

Après avoir retracé les grandes étapes qui ont conduit à la création de la Plateforme intergouvernementale sur la biodiversité et les services écosystémiques (IPBES), fonctionnelle depuis début 2013, cet article décrit les points-clés de la seconde session plénière d'IPBES qui s'est tenue à Antalya, en Turquie, en décembre 2013. Une série de décisions rangées sous l'appellation de "consensus d'Antalya" ont été prises par des représentants de 115 États dans trois grands domaines : le programme de travail pour les cinq années à venir (2014-2018), les règles et procédures de fonctionnement de la plateforme ainsi que les engagements financiers permettant de lui conférer l'autonomie suffisante pour son fonctionnement. D'autres questions sont restées en suspens, notamment celle de la place accordée aux acteurs non étatiques dans ce processus intergouvernemental. La troisième session plénière d'IPBES aura lieu à Bonn du 12 au 17 janvier 2015 : elle devrait, entre autres, débattre de la thématique de la pollinisation et de la production de nourriture. (Résumé d'auteur)

<http://dx.doi.org/10.1051/nss/2014040> Cirad-Agritrop Dk : 574490

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

58

Barnaud, C., and Antona, M. (2014)

Deconstructing ecosystem services: Uncertainties and controversies around a socially constructed concept

Deconstructing ecosystem services: Uncertainties and controversies around a socially constructed concept

Geoforum vol.56

Because of its success, the concept of ecosystem services (ES) is increasingly taken for granted, without sufficient questioning of the strong uncertainties and controversies that surround it. In this paper, we consider this concept as socially constructed and we analyze the surrounding controversies in order to decipher the process through which it is constructed. From a literature review, we identify five main domains of controversies: (i) scientific uncertainties relating to causal relationships that underlie ES production, (ii) multiple understandings of the very concept of ES due to different

representations of human-nature relationships, (iii) diverging opinions regarding the idea of valuing ES and the notion of value itself, (iv) conflicts of interests, power plays, and scale issues associated with the management of ES, and (v) controversies around the policy tools derived from the ES concept. In conclusion, we advocate for a greater engagement of human geographers in these debates. We emphasize in particular the need to study the complex social interdependences underlying ES dynamics, and to engage in participatory research exploring the potential of collaborative options for the management of ES. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.geoforum.2014.07.003> Cirad-Agritrop Dk : 573826

Articles publiés dans une revue à facteur d'impact

59

Karsenty, A. (2013)

De la nature des "paiements pour services environnementaux"

De la nature des "paiements pour services environnementaux"

Revue du Mauss n°42

<http://dx.doi.org/10.3917/rdm.042.0261> Cirad-Agritrop Dk : 571627

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

60

Calado da Costa, R., Piketty, M.-G., and Abramovay, R. (2013)

Pagamentos por serviços ambientais, custos de oportunidade e a transição para usos da terra alternativos: o caso de agricultores familiares do Nordeste Paraense

Pagamentos por serviços ambientais, custos de oportunidade e a transição para usos da terra alternativos: o caso de agricultores familiares do Nordeste Paraense

Sustentabilidade em debate vol.4:n°1

In this article, we evaluate the role that the payment for environmental services proposed by public policy Proambiente (2003-2007) might have had on the replacement of traditional land use (slash-and-burn cultivation) and the adoption of alternative land uses, able to provide higher levels of environmental services, among family farmers in the Northeast of Pará, Brazilian Amazon. For this, we simulated scenarios with estimates of opportunity costs for traditional and alternative land uses (fire-free fallow management, agroforestry, açaí management, fallow vegetation enrichment and beekeeping). The results indicated that payment of Proambiente would have been insufficient to encourage the abandonment of traditional land use and could have been more promising to provide conditions for family farmers to carry out the transition to land uses capable of providing higher levels of income in the long term, such as agroforestry and açaí management. (Résumé d'auteur)

<http://seer.bce.unb.br/index.php/sust/article/view/9202> Cirad-Agritrop Dk : 572423

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

61

Eloy, L., and Coudel, E. (2013)

Implementando Pagamentos por Serviços Ambientais no Brasil: caminhos para uma reflexão crítica

Implementando Pagamentos por Serviços Ambientais no Brasil: caminhos para uma reflexão crítica

Sustentabilidade em debate vol.4:n°1

This study analyzes the evolution of policies and programs for Payments for Environmental Services - PES in Brazil and discusses the implications of prevailing models for reconciling conservation and development. PES emerged from initiatives of productive diversification and agroecological transition. However, its institutionalization in public policies favors a convergence towards forest conservation and restoration. This shift is related to: 1) the priority given by the Federal Government to deforestation control; 2) the expectations around REDD funds; 3) the proposal to include PES in the Brazilian Forest Code. This trend coincides with the use of satellite images to monitor land-use, which produces a binary representation of the landscape. This justifies conventional models of agricultural intensification and nature protection, which do not take into account the provision of environmental services through traditional agricultural practices. Therefore, access of farmers to PES is contingent on their access to scientific-technical networks that structure local institutional arrangements. (Résumé d'auteur)

<http://seer.bce.unb.br/index.php/sust/article/view/9198> Cirad-Agritrop Dk : 572424

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

62

Locatelli, B., Imbach, P., and Wunder, S. (2014)

Synergies and trade-offs between ecosystem services in Costa Rica

Synergies and trade-offs between ecosystem services in Costa Rica

Environmental conservation vol.41:n°1

Ecosystems services have become a key concept in understanding the way humans benefit from ecosystems. In Costa Rica, a pioneer national scheme of payment provides compensation for forest conservation that is assumed to jointly produce services related to biodiversity conservation, carbon storage, water and scenic beauty, but little is known about the spatial correlations among these services. A spatial assessment, at national scale and with fine resolution, identified the spatial congruence between these services, by considering the biophysical potential of service provision and socioeconomic demand. Services have different spatial distributions but are positively correlated. Spatial synergies exist between current policies (national parks and the payment scheme) and the conservation of ecosystem services: national parks and areas receiving payments provide more services than other areas. Biodiversity hotspots have the highest co-benefits for other services, while carbon hotspots have the lowest. This finding calls for cautiousness in relation to expectations that forest-based mitigation initiatives such as REDD (reducing emissions from deforestation and forest degradation) can automatically maximize bundled co-benefits for biodiversity and local ecosystem services. (Résumé d'auteur)

<http://dx.doi.org/10.1017/S0376892913000234> Cirad-Agritrop Dk : 572073

Articles publiés dans une revue à facteur d'impact

63

Legrand, T., Frogier, G., and Le Coq, J.-F. (2013)

Institutional performance of Payments for Environmental Services: An analysis of the Costa Rican Program

Institutional performance of Payments for Environmental Services: An analysis of the Costa Rican Program

Forest policy and economics vol.37

In the growing literature on "payments for environmental services" schemes, so far not much attention has been paid to their institutional dimensions when assessing their performance; this is especially true of the Costa Rican case. This paper provides an analysis of the institutional performance of the Costa Rican Payment for Environmental Services Program (PESP). While recognizing its low additionality, our analysis highlights its positive long-term and indirect environmental impacts via the discontinuation of agriculture and institutional interplays. It also recognizes social impact as a secondary objective of the program, concluding that its current social performance is poor. However, it concludes that the program has higher sustainability, due to its strong legitimacy, than Coasean analyses suggest by focusing solely on its financing. Our analysis shows the risks and limitations of Coasean recommendations that focus on improving PESP cost-effectiveness. It proposes instead to strengthen the program's strategic management, to give more importance to other modalities than the forest protection one and to improve other institutions of the forest sector. This includes stricter enforcement of the law prohibiting deforestation. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.forpol.2013.06.016> Cirad-Agritrop Dk : 571315

Articles publiés dans une revue à facteur d'impact

64

Le Coq, J.-F., Frogier, G., Legrand, T., Pesche, D., and Saenz-Segura, F. (2013)

The governance of Costa Rica's programme of payments for environmental services: A stakeholder's perspective. In "Governing the provision of ecosystem services. - Dordrecht : Springer [Pays-Bas], 2013", pp. 237-257.

The Costa Rican Payment for Environmental Services Program (PESP) was a pioneer programme to be developed using the notion of Environmental Services (ES). The PESP has been analysed as a very promising and innovating instrument for conservation purposes. As such, many scholars analysed the PESP and discussed its efficiency and its effects on poverty alleviation. In this chapter, we adopt an institutional framework to analyse the genesis and evolution of the PESP underlying the role of stakeholders. We show that PES governance is a social construction where many stakeholders are interacting to orient the objectives and functioning of the PESP towards their vision and interests. Indeed, the main decisions regarding the programme's features reflect the state and evolution of forest stakeholders' power balance and their learning process. (Résumé d'auteur)

http://dx.doi.org/10.1007/978-94-007-5176-7_12 Cirad-Agritrop : CD_P01 MUR 16272 Dk : 567513

65

Grimaldi, M., Oszwald, J., Dolédec, S., Del Pilar Hurtado, M., Miranda, I. d. S., De Sartre, X. A., Santos de Assis, W., Castañeda, E., Desjardins, T., Dubs, F., Guevara, E., Gond, V., Lima, T. T. S., Marichal, R., Michelotti, F., Mitja, D., Noronha, N. C., Delgado Oliveira, M. N., Ramirez, B., Rodriguez, G., Sarrazin, M., Da Silva Jr, M. L., Costa, L. G. S., De Souza, S., Veiga, I., Velasquez, E., and Lavelle, P. (2014)

Ecosystem services of regulation and support in Amazonian pioneer fronts: searching for landscape drivers

Ecosystem services of regulation and support in Amazonian pioneer fronts: searching for landscape drivers

Landscape ecology vol.29:n°2

Landscape dynamics result from forestry and farming practices, both of which are expected to have diverse impacts on ecosystem services (ES). In this study, we investigated this general statement for regulating and supporting services via an assessment of ecosystem functions: climate regulation via carbon sequestration in soil and plant biomass, water cycle and soil erosion regulation via water infiltration in soil, and support for primary production via soil chemical quality and water storage. We tested the hypothesis that patterns of land-cover composition and structure significantly alter ES metrics at two different scales. We surveyed 54 farms in two Amazonian regions of Brazil and Colombia and assessed land-cover composition and structure from remote sensing data (farm scale) from 1990 to 2007. Simple and well-established methods were used to characterize soil and vegetation from five points in each farm (plot scale). Most ES metrics were significantly correlated with land-use (plot scale) and land-cover (farm scale) classifications; however, spatial variability in inherent soil properties, alone or in interaction with land-use or land-cover changes, contributed greatly to variability in ES metrics. Carbon stock in above-ground plant biomass and water infiltration rate decreased from forest to pasture land covers, whereas soil chemical quality and plant-available water storage capacity increased. Land-cover classifications based on structure metrics explained significantly less ES metric variation than those based on composition metrics. Land-cover composition dynamics explained 45 % ($P < 0.001$) of ES metric variance, 15 % by itself and 30 % in interaction with inherent soil properties. This study describes how ES evolve with landscape changes, specifying the contribution of spatial variability in the physical environment and highlighting trade-offs and synergies among ES. (Résumé d'auteur)

<http://dx.doi.org/10.1007/s10980-013-9981-y> Cirad-Agritrop Dk : 572921

Articles publiés dans une revue à facteur d'impact

66

Pesche, D. (2013)

Le Millennium Ecosystem Assessment : anatomie d'une évaluation environnementale globale

Le Millennium Ecosystem Assessment : anatomie d'une évaluation environnementale globale

Nature sciences sociétés vol.21:n°4

La notion de service écosystémique (SE) a été élaborée progressivement dans les milieux scientifiques dans le courant des années 1990. C'est à l'occasion d'une évaluation environnementale globale, le Millennium Ecosystem Assessment (MA), que cette notion acquiert une reconnaissance internationale auprès d'un public diversifié (décideurs publics, secteur privé, ONG, etc.). Depuis 2005, la notion de SE connaît un fort développement dans différentes arènes : biodiversité, politiques sectorielles (forêts, agriculture, eau, etc.), changement global, etc. Cet article se fonde sur l'hypothèse exploratoire que le processus du MA, en s'appuyant sur l'articulation entre des réseaux diversifiés de scientifiques et de décideurs, a joué un rôle-clé dans la reconnaissance puis la large diffusion de cette notion de SE à différentes échelles (conventions internationales, politiques domestiques, dispositifs d'action publique locaux)1. Il souligne aussi la place déterminante des acteurs insérés ou liés au champ scientifique des États-Unis. (Résumé d'auteur)

<http://dx.doi.org/10.1051/nss/2014001> Cirad-Agritrop Dk : 572972

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

67

Pesche, D., Mérat, P., Hrabanski, M., and Bonnin, M. (2013)

Ecosystem services and payments for environmental services: Two sides of the same coin? / In "Governing the provision of ecosystem services. - Dordrecht : Springer [Pays-Bas], 2013", pp. 69-88.

The topic of ecosystem services, ecological services, environmental services (ES) and payments for environmental services (PES) has recently become the main reference for international environmental

policies (broadly including forest policy, agro-environmental measures and conservation policies). Brought to media attention by the Millennium Ecosystem Assessment (MA) in 2005, these notions have spread rapidly in both political and scientific arenas. But there has been very little analysis retracing the social construction and political scope of these concepts in the scientific and policy fields. It is as if thinking in terms of ecosystem services and promoting payments for environmental services were taken for granted. This chapter seeks to fill this gap, offering a historical and institutional analysis that explores the relationship between the ES and PES concepts. We put forward the hypothesis that two relatively independent processes led to the emergence of the ES concept on one hand and the PES concept on the other. Whereas the concept of ES is closely linked to a desire to attract official attention to the threats to ecosystems posed by human pressure, the concept of PES seems rather to have stemmed from a concern to ensure funding for conservation in tropical countries over the long term. In the past few years, the two concepts have gradually converged, apparently due to a shared desire to translate them into operational form through public policy instruments. Taking a multidisciplinary approach combining political science, sociology, economics and law, we aim to substantiate this hypothesis using the notion of an epistemic configuration, derived from that of an epistemic community (Haas, Int Organ 46: 1-35, 1992), to highlight the composite nature of the networks involved in the emergence and promotion of PES schemes. In the first section below, we study the genesis of the concepts of ES and PES, showing how the two terms are connected with different epistemic configurations. In the second section, we show how the two concepts have converged at the international level, during the MA process but mainly afterwards. In the third section, we try to identify new trends and ongoing processes concerning ES and PES. (Résumé d'auteur)

http://dx.doi.org/10.1007/978-94-007-5176-7_4 Cirad-Agritrop : CD_P01 MUR 16272 Dk : 567512

68

Pramova, E., and Locatelli, B. (2013)

Guidebook on integrating community-based adaptation into REDD+ projects : Lessons from Indonesia and the Philippines, CIFOR, Jakarta. 60 p.

REDD+ interventions can help both people and forests adapt to climate change by conserving or enhancing biodiversity and forest ecosystem services. However, additional adaptation measures might be needed, such as the protection of agriculture and livelihoods and the development of fire management strategies. Such measures could support the sustainability of REDD+ interventions and the permanence of carbon stocks by preventing activity displacement and induced deforestation and by limiting or avoiding damage to livelihoods and ecosystems from extreme weather events. This guidebook demonstrates how community-based adaptation (CBA) can be integrated into REDD+ interventions and other mitigation activities through a 5-step approach. In addition to vulnerability analysis, a combination of participatory and analytical methods is proposed to capture the voices of multiple stakeholders at the community and broader levels and examine the linkages between adaptation interventions and REDD+. Special emphasis is placed on forest resources and forest management to explore the potential costs and benefits of adaptation interventions for effective REDD+ implementation. Case-studies from Indonesia and the Philippines demonstrate how the steps can be followed. The case study activities and the production of this guidebook were made possible by the financial contribution of the German Federal Ministry for Economic Cooperation and Development (BMZ) and the technical and logistical assistance of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). (Résumé d'auteur)

http://www.cifor.org/publications/pdf_files/Books/BPramova1301.pdf Cirad-Agritrop Dk : 571789

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Tixier, P., Peyrard, N., Aubertot, J.-N., Gaba, S., Radoszycki, J., Caron-Lormier, G., Vinatier, F., Mollot, G., and Sabbadin, R. (2013)

Modelling interaction networks for enhanced ecosystem services in agroecosystems. In "Ecological Networks in an Agricultural World / by Guy Woodward and David A. Bohan (eds.). - Amsterdam : Elsevier, 2013. - (Advances in Ecological Research ; 49). - ISBN 978-0-12-420002-9", pp. 437-480.

The development of new methods and approaches for ensuring the sustainability of agriculture and ecosystem services is an important challenge that ecologists, agronomists, and theoreticians must address together. Enhancement of ecosystem services needs to be addressed at different scales and should include the interaction between farmland biodiversity and stakeholders (farmers, managers, policy makers, etc.) to optimize service delivery. Predictions require an understanding of the interactions between numerous management options and components of biodiversity. Here, we argue that interaction networks on a broad sense (from food webs to landscapes networks in which nodes

could be species, trophic groups, fields or farms) can help address this high level of complexity. We examine how tools from mathematics and artificial intelligence, developed for network modelling and reasoning, could be useful for assessing and enhancing ecosystems services. In doing this we highlight the gaps that currently exist between our questions about ecosystem service provision and our ability to answer them with current modelling approaches. We illustrate the use of these tools with three case studies related to 'pest regulation services'. These include food web approaches to assess animal pest regulation services and decisional models to address management strategies for diseases and weeds. Finally, we describe how different types of network models might operate at different scales of management. The future challenge for agroecologists will be to produce models of interactions and emergent ecosystem services, which are sufficiently quantified and validated. We suggest that network ecology is a nascent research topic that is developing a strong and unified empirical and theoretical foundation, which could serve as the central paradigm for a sustainable, intensive agriculture in the future. (Résumé d'auteur)

<http://dx.doi.org/10.1016/B978-0-12-420002-9.00007-X> Cirad-Agritrop Dk : 572089

70

Locatelli, B. (2013)

Services écosystémiques et changement climatique. HDR, Université Grenoble 1, CIRAD-ES-UPR BSef. 79 p.

Cirad-Agritrop Dk : 569260

71

De Moraes Sa, J. C., Bürkner dos Santos, J., Lal, R., De Moraes, A., Tivet, F., Machado Sá, M. F., Briedis, C., De Oliveira Ferreira, A., Eurich, G., Farias, A., and Friedrich, T. (2013)

Soil-specific inventories of landscape carbon and nitrogen stocks under no-till and native vegetation to estimate carbon offset in a subtropical ecosystem

Soil-specific inventories of landscape carbon and nitrogen stocks under no-till and native vegetation to estimate carbon offset in a subtropical ecosystem

Soil science society of America journal vol.77:n°6

Inventories of C and N footprints on a landscape scale are essential tools for estimating C offsets from agricultural emissions. Therefore, the aims of this study conducted in the subtropical humid ecosystem in southern Brazil were to: (i) conduct a soil-specific inventory of landscape soil C and N stocks with reference to soil order, soil texture, and land use/management type; (ii) estimate accretion rates for soil organic C (SOC) and total N (TN) for areas managed under no-till (NT) practices management with reference to native vegetation (NV) based on this inventory; (iii) generate a map of C stocks for each land use system; and (iv) calculate estimated C offset for the region through the use of NT compared to conventional tillage (CT). Soil samples were collected at 324 points to a 1-m depth from the entire region. Soil texture and duration of NT had a strong influence on C and N stocks. The average soil C stock across all types of soils for depths of 0-40 and 40-100 cm was 57.0 and 43.0%, respectively. The extrapolation of C stored in the 0- to 40-cm depth based on the NT management for 11 and 20 yr for 1.52 million hectare (Mha) was 9.08 ± 0.62 Tg (1 Tg = 1012 g) representing 11.9% of the C stored in all soil orders. The long-term of C sink capacity by conversion of arable land from CT to NT in this region is 33.2 Tg of CO₂, with the C offset of 22.5% of all anthropogenic emissions. (Résumé d'auteur)

<http://dx.doi.org/10.2136/sssaj2013.01.0007> Cirad-Agritrop Dk : 571358

Articles publiés dans une revue à facteur d'impact

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Tivet, F., De Moraes Sa, J. C., Lal, R., Bastos Pereira Milori, D. M., Briedis, C., Letourmy, P., Pinheiro, L. A., Borszowskei, P. R., and Da Cruz Hartman, D. (2013)

Assessing humification and organic C compounds by laser-induced fluorescence and FTIR spectroscopies under conventional and no-till management in Brazilian Oxisols

Assessing humification and organic C compounds by laser-induced fluorescence and FTIR spectroscopies under conventional and no-till management in Brazilian Oxisols

Geoderma vol.207-208

Data on humification is important to assessing the rate and magnitude of soil carbon (C) sequestration. Thus, this study assessed the humification degree (HLIF) of soil organic matter (SOM) and the changes in functional C groups (aromatic-C and aliphatic-C) for contrasting land use and management practices (native vegetation (NV), conventional plow-based tillage (CT) and no-till (NT))

systems) in sub-tropical and tropical Brazilian environments. Experiments were conducted at Ponta Grossa (PG) in Paraná State and Lucas do Rio Verde (LRV) in Mato Grosso State of Brazil. Laser-induced fluorescence (LIFS) and Fourier-transform infrared (FTIR) spectroscopies, were used on whole soil samples to 1-m depth, and on seven aggregate size classes (8-19, 4-8, 2-4, 1-2, 0.5-1, 0.25-0.5, 0.053-0.25 mm) obtained by wet sieving of 0-5 and 5-10 cm layers. Three functional C groups were selected based on FTIR: aliphatic-C1 (1404 cm⁻¹ 1), aromatic-C (1632 cm⁻¹ 1), and aliphatic-C2 (2852 and 2922 cm⁻¹ 1). The HLIF was 3 to 5 times higher at the LRV site than at PG at all soil depths, indicating that selective preservation by aromaticity of SOM is the predominant mechanism in this environment. Relatively lower HFIL was observed in NT soils at both locations because of aggregation which protects most labile moieties. The depletion of C concentration in CT was related to the decrease in functional C groups (i.e., aromatic-C and aliphatic-C) and an overall increase in the humification degree, indicating that physical protection mechanisms are not sufficient to protect the labile fractions of OM. In contrast, the intensity of functional C groups under NT systems was similar to that in the soil under NV at both locations. A discriminant analysis of principal components clearly showed that soils at both locations can be clustered into three groups, corresponding to the three main land-use and management practices. Thus, soils under NV, NT, and CT differed significantly in terms of the composition of organic compounds, and in the interactions between inorganic and organic fractions. Land use changes modify the arrangement of organic compounds necessitating the diversification of agroecosystems and conversion to NT farming. Altogether, our results reveal that LIFS and FTIR are fast, efficient, and precise techniques for analyzing the degree of SOC humification, functional C groups, and hence the efficiency of NT cropping systems in promoting long-term carbon sequestration in soils. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.geoderma.2013.05.001> Cirad-Agritrop Dk : 569733

Articles publiés dans une revue à facteur d'impact

73

Chotte, J.-L., Diouf, M., Assigbetse, K., Lesueur, D., Rabary, B., and Sall, S. (2013)

Unexpected similar stability of soil microbial CO₂ respiration in 20-year manured and in unmanured tropical soils

Unexpected similar stability of soil microbial CO₂ respiration in 20-year manured and in unmanured tropical soils

Environmental Chemistry Letters vol.11:n°2

Soil respiration is one of the main CO₂ sources from terrestrial ecosystems. Soil respiration is therefore a major source of greenhouse gas. Knowledge of the impact of agronomic practices such as manuring on the stability, for example resistance and resilience, of heterotrophic C- CO₂ respiration to disturbance is scarce. Here, we studied the stability of soil microbial heterotrophic respiration of two tropical soils from plots annually enriched or not with manure applications during more than 20 years. Stability was quantified after heating soils artificially. We hypothesized that field manuring would change the stability of the microbial community. Additionally, the impact of both manured and unmanured soils to addition of an organic cocktail was assessed under controlled conditions in order to discriminate the metabolic capacity of the microbial community, and to link the metabolic capacity up with the microbial heterotrophic soil respiration. Our results show that total respiration was not significantly different in manured and unmanured pots. Moreover, contrary to our hypothesis, manure amendment did not affect the stability (resistance, resilience) of the microbial abundance or the basal metabolism, in our experimental conditions. By contrast, the diversity of the bacterial community in heated soils was different from that in unheated soils. After heating, surviving microorganisms showed different carbon utilization efficiency, manuring stimulating the growth of different resistant communities, that is, r-strategist or Kstrategist. Microbial community of manured soils developed in the presence of the organic cocktail was less resistant to heating than microbial community of unmanured plots. (Résumé d'auteur)

<http://dx.doi.org/10.1007/s10311-012-0388-9> Cirad-Agritrop Dk : 570109

Articles publiés dans une revue à facteur d'impact

74

Razafimbelo-Andriamifidy, T., Chevallier, T., Albrecht, A., Chapuis-Lardy, L., Rakotondrasolo, F. N., Michellon, R., Rabeharisoa, R. L., and Bernoux, M. (2013)

Texture and organic carbon contents do not impact amount of carbon protected in Malagasy soils

Texture and organic carbon contents do not impact amount of carbon protected in Malagasy soils

Scientia agricola vol.70:n°3

Soil organic carbon (SOC) is usually said to be well correlated with soil texture and soil aggregation. These relations generally suggest a physical and physicochemical protection of SOC within soil aggregates and on soil fine particles, respectively. Because there are few experimental evidences of these relations on tropical soils, we tested the relations of soil variables (SOC and soil aggregate contents, and soil texture) with the amount of SOC physically protected in aggregates on a set of 15 Malagasy soils. The soil texture, the SOC and water stable macroaggregate (MA) contents and the amount of SOC physically protected inside aggregates, calculated as the difference of C mineralized by crushed and intact aggregates, were characterized. The relation between these variables was established. SOC content was significantly correlated with soil texture (clay+fine silt fraction) and with soil MA amount while protected SOC content was not correlated with soil MA amount. This lack of correlation might be attributed to the highest importance of physicochemical protection of SOC which is demonstrated by the positive relation between SOC and clay+fine silt fraction. (Résumé d'auteur)

<http://dx.doi.org/10.1590/S0103-90162013000300009> Cirad-Agritrop Dk : 570593

Articles publiés dans une revue à facteur d'impact

75

Tivet, F., De Moraes Sa, J. C., Lal, R., Briedis, C., Borszowskei, P. R., Bürkner dos Santos, J., Farias, A., Eurich, G., Da Cruz Hartman, D., Nadolny Junior, M., Bouzinac, S., and Séguy, L. (2013)

Aggregate C depletion by plowing and its restoration by diverse biomass-C inputs under no-till in sub-tropical and tropical regions of Brazil

Aggregate C depletion by plowing and its restoration by diverse biomass-C inputs under no-till in sub-tropical and tropical regions of Brazil

Soil and tillage research vol.126

Encapsulation of soil organic carbon (SOC) within aggregates is one of the principal mechanisms for long-term C sequestration, macroaggregate formation and stabilization. Our objectives were to quantify the changes in aggregate size distribution, aggregate-C concentrations and stocks upon conversion of native vegetation (NV) to conventional plow-based tillage (CT), and to assess the rate of aggregation and SOC recovery with no-till (NT) under diverse biomass-C inputs. The study was conducted at both sub-tropical (Ponta Grossa - PG, State of Paraná) and tropical (Lucas do Rio Verde - LRV, State of Mato Grosso) sites in Brazil. The SOC content under NV was used as a baseline to evaluate the depletion rate under CT and the restoration rate under NT. A specific emphasis was given to the largest macroaggregate size class (8-19 mm) because of its importance to protecting the recently deposited labile SOC. A discriminant analysis of principal components (DAPC) indicated that NV soil is modified by conversion to an arable land use and that, mechanical tillage, biomass input, and their interactions drastically influence the distribution of aggregate-size classes, aggregation indices, and SOC distribution within aggregates. At both sites, soil aggregation indices were positively impacted by NT and associated with SOC concentration in the labile fractions (e.g., total polysaccharides (TPS), hot water extractable organic C (HWEOC), particulate organic C (POC)). At the PG site, the 8-19 mm aggregate size fraction was significantly affected by land use and tillage treatments and represented 54%, 43%, and 72%, under NV, CT, and NT in 0-20 cm depth, respectively. Furthermore, the 8-19 mm size fraction stored 55%, 45%, and 71% of the total SOC stock under NV (53.8 Mg C ha⁻¹), CT (28.5 Mg C ha⁻¹) and NT (51.2 Mg C ha⁻¹), respectively. At the LRV site, the 8-19 mm aggregate size fraction decreased from 50% under Cerrado NV to 35% under CT, and ranged from 33% to 51% under diverse biomass-C input under NT in 0-20 cm depth. The 8-19 mm size fraction stored 52%, 37%, and 41% of the total SOC stock across all aggregate sizes under NV (25.4 Mg C ha⁻¹), CT (11.7 Mg C ha⁻¹), and NT (9.9-18.1 Mg C ha⁻¹), respectively. The difference in SOC stock among land uses is largely attributed to storage in the 8-19 mm aggregate size class, indicating that NT cropping systems rebuilt the largest macroaggregates, which are crucial for stabilization of SOC. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.still.2012.09.004> Cirad-Agritrop Dk : 566235

Articles publiés dans une revue à facteur d'impact

76

Verma, M., Friedl, M. A., Richardson, A. D., Kiely, G., Cescatti, A., Law, B., Wohlfahrt, G., Gielen, B., Roupsard, O., Moors, E. J., Toscano, P., Vaccari, F. P., Ganelle, D., Bohrer, G., Varlagin, A., Buchmann, N., Van Gorsel, E., Montagnani, L., and Propastin, P. (2014)

Remote sensing of annual terrestrial gross primary productivity from MODIS: an assessment using the FLUXNET La Thuile data set

Remote sensing of annual terrestrial gross primary productivity from MODIS: an assessment using the FLUXNET La Thuile data set

Biogeosciences vol.11:n°8

Gross primary productivity (GPP) is the largest and most variable component of the global terrestrial carbon cycle. Repeatable and accurate monitoring of terrestrial GPP is therefore critical for quantifying dynamics in regional-to-global carbon budgets. Remote sensing provides high frequency observations of terrestrial ecosystems and is widely used to monitor and model spatiotemporal variability in ecosystem properties and processes that affect terrestrial GPP. We used data from the Moderate Resolution Imaging Spectroradiometer (MODIS) and FLUXNET to assess how well four metrics derived from remotely sensed vegetation indices (hereafter referred to as proxies) and six remote sensing-based models capture spatial and temporal variations in annual GPP. Specifically, we used the FLUXNET La Thuile data set, which includes several times more sites (144) and site years (422) than previous studies have used. Our results show that remotely sensed proxies and modeled GPP are able to capture significant spatial variation in mean annual GPP in every biome except croplands, but that the percentage of explained variance differed substantially across biomes (10-80%). The ability of remotely sensed proxies and models to explain interannual variability in GPP was even more limited. Remotely sensed proxies explained 40-60% of interannual variance in annual GPP in moisture-limited biomes, including grasslands and shrublands. However, none of the models or remotely sensed proxies explained statistically significant amounts of interannual variation in GPP in croplands, evergreen needleleaf forests, or deciduous broadleaf forests. Robust and repeatable characterization of spatiotemporal variability in carbon budgets is critically important and the carbon cycle science community is increasingly relying on remotely sensing data. Our analyses highlight the power of remote sensing-based models, but also provide bounds on the uncertainties associated with these models. Uncertainty in flux tower GPP, and difference between the footprints of MODIS pixels and flux tower measurements are acknowledged as unresolved challenges. (Résumé d'auteur)

<http://dx.doi.org/10.5194/bg-11-2185-2014> Cirad-Agritrop Dk : 574130

Articles publiés dans une revue à facteur d'impact

77

Stahl, C. É. s. (2013)

Actes de la journée : Le carbone en forêt et en prairies issues de déforestation en Guyane, processus, bilans et perspectives, 1er octobre 2013, Cayenne, Guyane française, Cayenne, Guyane française/Ed. CIRAD, Montpellier.2-87614-696-7 72 p.

<http://umr-selnet.cirad.fr/FichiersComplementaires/les%20actes%20du%20s%C3%A9minaire%20carpagg.pdf>
Cirad-Agritrop Dk : 574455

78

Marshall, K., Tu, K. P., Funk, C., Michaelsen, J., Williams, P., Williams, C., Ardo, J., Boucher, M., Cappelaere, B., De Grandcourt, A., Nickless, A., Nouvellon, Y., Scholes, R. J., and Kutsch, W. L. (2013)

Improving operational land surface model canopy evapotranspiration in Africa using a direct remote sensing approach

Improving operational land surface model canopy evapotranspiration in Africa using a direct remote sensing approach

Hydrology and Earth System Sciences vol.17

Climate change is expected to have the greatest impact on the world's economically poor. In the Sahel, a climatically sensitive region where rain-fed agriculture is the primary livelihood, expected decreases in water supply will increase food insecurity. Studies on climate change and the intensification of the water cycle in sub-Saharan Africa are few. This is due in part to poor calibration of modeled evapotranspiration (ET), a key input in continental-scale hydrologic models. In this study, a remote sensing model of transpiration (the primary component of ET), driven by a time series of vegetation indices, was used to substitute transpiration from the Global Land Data Assimilation System realization of the National Centers for Environmental Prediction, Oregon State University, Air Force, and Hydrology Research Laboratory at NationalWeather Service Land Surface Model (GNOAH) to improve total ET model estimates for monitoring purposes in sub-Saharan Africa. The performance of the hybrid model was compared against GNOAH ET and the remote sensing method using eight eddy flux towers representing major biomes of sub-Saharan Africa. The greatest improvements in model performance were at humid sites with dense vegetation, while performance at semi-arid sites was poor, but better than the models before hybridization. The reduction in errors using the hybrid model can be attributed to the integration of a simple canopy scheme that depends

primarily on low bias surface climate reanalysis data and is driven primarily by a time series of vegetation indices. (Résumé d'auteur)

<http://dx.doi.org/10.5194/hess-17-1079-2013> Cirad-Agritrop Dk : 568061

Articles publiés dans une revue à facteur d'impact

79

Sjöström, M., Zhao, M., Archibald, S., Arneth, A., Cappelaere, B., Falk, U., De Grandcourt, A., Hanan, N., Kergoat, L., Kutsch, W. L., Merbold, L., Mougin, E., Nickless, A., Nouvellon, Y., Scholes, R. J., Veenendaal, E. M., and Ardo, J. (2013)

Evaluation of MODIS gross primary productivity for Africa using eddy covariance data

Evaluation of MODIS gross primary productivity for Africa using eddy covariance data

Remote sensing of environment vol.131

MOD17A2 provides operational gross primary production (GPP) data globally at 1 km spatial resolution and 8-day temporal resolution. MOD17A2 estimates GPP according to the light use efficiency (LUE) concept assuming a fixed maximum rate of carbon assimilation per unit photosynthetically active radiation absorbed by the vegetation (?max). Minimum temperature and vapor pressure deficit derived from meteorological data down-regulate ?max and constrain carbon assimilation. This data is useful for regional to global studies of the terrestrial carbon budget, climate change and natural resources. In this study we evaluated the MOD17A2 product and its driver data by using in situ measurements of meteorology and eddy covariance GPP for 12 African sites. MOD17A2 agreed well with eddy covariance GPP for wet sites. Overall, seasonality was well captured but MOD17A2 GPP was underestimated for the dry sites located in the Sahel region. Replacing the meteorological driver data derived from coarse resolution reanalysis data with tower measurements reduced MOD17A2 GPP uncertainties, however, the underestimations at the dry sites persisted. Inferred ?max calculated from tower data was higher than the ?max prescribed in MOD17A2. This, in addition to uncertainties in fraction of absorbed photosynthetically active radiation (FAPAR) explains some of the underestimations. The results suggest that improved quality of driver data, but primarily a readjustment of the parameters in the biome parameter look-up table (BPLUT) may be needed to better estimate GPP for African ecosystems in MOD17A2. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.rse.2012.12.023> Cirad-Agritrop Dk : 567134

Articles publiés dans une revue à facteur d'impact

8.2.2. Ecologie végétale et animale (sauf bioagresseurs), paysage et végétation, conservation des ressources, biodiversité

80

Imbach, P., Locatelli, B., Molina, L. G., Ciais, P., and Leadley, P. (2013)

Climate change and plant dispersal along corridors in fragmented landscapes of Mesoamerica

Climate change and plant dispersal along corridors in fragmented landscapes of Mesoamerica

Ecology and Evolution vol.3:n°9

Climate change is a threat to biodiversity, and adaptation measures should be considered in biodiversity conservation planning. Protected areas (PA) are expected to be impacted by climate change and improving their connectivity with biological corridors (BC) has been proposed as a potential adaptation measure, although assessing its effectiveness remains a challenge. In Mesoamerica, efforts to preserve the biodiversity have led to the creation of a regional net-work of PA and, more recently, BC. This study evaluates the role of BC for facilitating plant dispersal between PA under climate change in Mesoamerica. A spatially explicit dynamic model (cellular automaton) was developed to simulate species dispersal under different climate and conservation policy scenarios. Plant functional types (PFT) were defined based on a range of dispersal rates and vegetation types to represent the diversity of species in the region. The impacts of climate change on PA and the role of BC for dispersal were assessed spatially. Results show that most impacted PA are those with low altitudinal range in hot, dry, or high latitude areas. PA with low altitudinal range in high cool areas benefit the most from corridors. The most important corridors cover larger areas and have high altitude gradients. Only the fastest PFT can keep up with the expected change in climate and benefit from corridors for dispersal. We conclude that the spatial assessment of the vulnerability of PA and the role of corridors in facilitating dispersal can help conservation planning under a changing climate. (Résumé d'auteur)

<http://dx.doi.org/10.1002/ece3.672> Cirad-Agritrop Dk : 571242

Articles publiés dans une revue à facteur d'impact

81

Piou, C., and Prévost, E. (2013)

Contrasting effects of climate change in continental vs. oceanic environments on population persistence and microevolution of Atlantic salmon

Contrasting effects of climate change in continental vs. oceanic environments on population persistence and microevolution of Atlantic salmon

Global change biology vol.19:n°3

Facing climate change (CC), species are prone to multiple modifications in their environment that can lead to extinction, migration or adaptation. Identifying the role and interplay of different potential stressors becomes a key question. Anadromous fishes will be exposed to both river and oceanic habitat changes. For Atlantic salmon, the river water temperature, river flow and oceanic growth conditions appear as three main stressing factors. They could act on population dynamics or as selective forces on life-history pathways. Using an individual-based demo-genetic model, we assessed the effects of these factors (1) to compare risks of extinction resulting from CC in river and ocean, and (2) to assess CC effects on life-history pathways including the evolution of underlying genetic control of phenotypic plasticity. We focused on Atlantic salmon populations from Southern Europe for a time horizon of three decades. We showed that CC in river alone should not lead to extinction of Southern European salmon populations. In contrast, the reduced oceanic growth appeared as a significant threat for population persistence. An increase in river flow amplitude increased the risk of local extinction in synergy with the oceanic effects, but river temperature rise reduced this risk. In terms of life-history modifications, the reduced oceanic growth increased the age of return of individuals through plastic and genetic responses. The river temperature rise increased the proportion of sexually mature parr, but the genetic evolution of the maturation threshold lowered the maturation rate of male parr. This was identified as a case of environmentally driven plastic response that masked an underlying evolutionary response of plasticity going in the opposite direction. We concluded that to counteract oceanic effects, river flow management represented the sole potential force to reduce the extinction probability of Atlantic salmon populations in Southern Europe, although this might not impede changes in migration life history. (Résumé d'auteur)

<http://dx.doi.org/10.1111/gcb.12085> Cirad-Agritrop Dk : 567681

Articles publiés dans une revue à facteur d'impact

82

Vieilledent, G., Cornu, C., Cuni Sanchez, A., Leong Pock Tsy, J.-M., and Danthu, P. (2013)

Vulnerability of baobab species to climate change and effectiveness of the protected area network in Madagascar: Towards new conservation priorities

Vulnerability of baobab species to climate change and effectiveness of the protected area network in Madagascar: Towards new conservation priorities

Biological Conservation vol.166

Baobab species are representative of the high biodiversity and endemism rates that place Madagascar in the top three of the countries with the highest biodiversity in the world. In this study, we estimated the vulnerability of three endangered Malagasy baobab species (*Adansonia grandiflora* Baill., *Adansonia perrieri* Capuron and *Adansonia suarezensis* H. Perrier) to climate change and the effectiveness of the protected area network (PAN) for the future conservation of these species. To estimate the environmental niche of the species, we used an original data-set based on satellite image analysis to detect species presence and an ensemble modelling approach using three species distribution models (GLM, GAM and MaxEnt). We projected the species distribution in 2050 and 2080 using an ensemble forecasting approach combining the three species distribution models and three global circulation models for climate projections. Measures of connectivity were employed to assess the present and future effectiveness of the existing PAN. Among the three baobab species studied, two are severely threatened by climate change (*A. perrieri* and *A. suarezensis*), in part because the present PAN does not overlap with future species distribution areas. Recently, strong efforts have been made in designing an optimised PAN to conserve Madagascar outstanding biodiversity. Nevertheless, its future effectiveness is questioned by the potential shifts in species distributions due to predicted changes in climate. In the context of climate change, alternative strategies such as ecological restoration would also have to be adopted to conserve biodiversity in Madagascar. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.biocon.2013.06.007> Cirad-Agritrop Dk : 570122

Articles publiés dans une revue à facteur d'impact

83

Bégué, A., Vintrou, E., and Saad, A. (2014)

Differences between cropland and rangeland MODIS phenology (start-of-season) in Mali

Differences between cropland and rangeland MODIS phenology (start-of-season) in Mali

International journal of applied earth observation and geoinformation vol.31

Start-of-season data are more and more used to qualify the land surface phenology trends in relation with climate variability and, more rarely, with human land management. In this paper, we compared the phenology of rangeland vs cropped land in the Sahel belt of Africa, using the only currently available global phenology product (MODIS MCD12Q2 - Land Cover Dynamics Yearly), and an enhanced crop mask of Mali. The differences in terms of start-of-season (SOS) are spatially (north south gradient), and temporally (10 years, 2001-2009) analyzed in bioclimatic terms. Our results show that globally the MODIS MCD12Q2 SOS dates of croplands and rangelands differ, and that these differences depend on the bioclimatic zone. In Sahelian and Guinean regions, cropland vegetation begins to grow earlier than rangeland vegetation (8-day and 4-day advance, respectively). Between, in the Sudanian and Sudano-Sahelian parts of Mali, rangeland vegetation greens about one week earlier than croplands. These results are discussed in the context of the land surface heterogeneity at MODIS scale, and in the context of the natural vegetation ecology. These results could help interpreting phenological trends in climate change analysis. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.jag.2014.03.024> Cirad-Agritrop Dk : 573552

Articles publiés dans une revue à facteur d'impact

84

Yatat, V., Dumont, Y., Tewa, J. J., Couteron, P., and Bowong, S. (2014)

Mathematical analysis of a size structured tree-grass competition model for savanna ecosystems

Mathematical analysis of a size structured tree-grass competition model for savanna ecosystems

Biomath vol.3:n°1

Several continuous-time tree-grass competition models have been developed to study conditions of long-lasting coexistence of trees and grass in savanna ecosystems according to environmental parameters such as climate or fire regime. In those models, fire intensity is a fixed parameter while the relationship between woody plant size and fire-sensitivity is not systematically considered. In this paper, we propose a mathematical model for the tree-grass interaction that takes into account both fire intensity and size-dependent sensitivity. The fire intensity is modeled by an increasing function of grass biomass and fire return time is a function of climate. We carry out a qualitative analysis that highlights ecological thresholds that summarize the dynamics of the system. Finally, we develop a non-standard numerical scheme and present some simulations to illustrate our analytical results. (Résumé d'auteur)

<http://dx.doi.org/10.11114/j.biomath.2014.04.212> Cirad-Agritrop Dk : 573439

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

85

Tassin, J., and Kull, C. A. (2014)

Facing the broader dimensions of biological invasions

Facing the broader dimensions of biological invasions

Land use policy vol.42

Invasive species are an excellent opportunity to think about the nature society desires, particularly in the face of global changes. Nature and human views of nature are rapidly evolving; our approach to biological invasions through biosecurity institutions and land management policies must evolve in tandem with these changes. We review three dimensions that are insufficiently addressed. First, biological invasions are culturally shaped and interpreted. Humans play a major role in the movement and nurturing of alien life, and esthetics, perception, and emotion are deeply implicated in the management of invasive species. What people fear or regret with invasive species are not their effects on nature per se, but their effects on a particular desired nature, and policymaking must reflect this. Second, biological invasions are not restricted to negative impacts. Invasions take place in landscapes where many natural conditions have been altered, so policy tools must recognize that invasive species are a functional, structural, and compositional part of transformed ecosystems. In some cases, native species benefit from changes in resource availability caused by invasions or from protections provided by an invasive plant. Finally, invasive species can help ecosystems and people to adapt to global change by maintaining ecosystem processes such as productivity, carbon storage, and nutrient cycling in a context of climate change or land cover transformations. While recognition is growing among ecologists that novel, invaded ecosystems have value, and while the on-the-ground application

of biosecurity policies has of necessity adjusted to local contexts and other agendas, invasion biology could aid policymaking by better addressing the three complexities inherent in the three dimensions highlighted above. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.landusepol.2014.07.014> Cirad-Agritrop Dk : 573993

Articles publiés dans une revue à facteur d'impact

86

Hénaut, Y., Corbara, B., Pélozuelo, L., Azémard, F., Cérégino, R., Hérault, B., and Déjean, A. (2014)

A tank bromeliad favors spider presence in a neotropical inundated forest

A tank bromeliad favors spider presence in a neotropical inundated forest

PLoS One vol.9:n°12

Tank bromeliads are good models for understanding how climate change may affect biotic associations. We studied the relationships between spiders, the epiphytic tank bromeliad, *Aechmea bracteata*, and its associated ants in an inundated forest in Quintana Roo, Mexico, during a drought period while, exceptionally, this forest was dry and then during the flooding that followed. We compared spider abundance and diversity between 'Aechmea-areas' and 'controlareas' of the same surface area. We recorded six spider families: the Dipluridae, Ctenidae, Salticidae, Araneidae, Tetragnathidae and Linyphiidae among which the funnel-web tarantula, *Ischnothelus caudata*, the only Dipluridae noted, was the most abundant. During the drought period, the spiders were more numerous in the *Aechmea*-areas than in the control-areas, but they were not obligatorily associated with the *Aechmea*. During the subsequent flooding, the spiders were concentrated in the *A. bracteata* patches, particularly those sheltering an ant colony. Also, a kind of specificity existed between certain spider taxa and ant species, but varied between the drought period and subsequent flooding. We conclude that climatic events modulate the relationship between *A. bracteata* patches and their associated fauna. Tank bromeliads, previously considered only for their ecological importance in supplying food and water during drought, may also be considered refuges for spiders during flooding. More generally, tank bromeliads have an important role in preserving non-specialized fauna in inundated forests. (Résumé d'auteur)

<http://dx.doi.org/10.1371/journal.pone.0114592> Cirad-Agritrop Dk : 575010

Articles publiés dans une revue à facteur d'impact

87

Baguette, M., and Locatelli, B. (2013)

Les aires protégées continentales. In "S'adapter au changement climatique : agriculture, écosystèmes et territoires. - Versailles : Ed. Quae, 2013", pp. 195-212.

Cirad-Agritrop : CD_P40 SOU 16668; BA_P40 SOU 5747 Dk : 570831

88

Barrabé, L. (2013)

Systématique et évolution du genre #Psychotria# (Rubiaceae) en Nouvelle-Calédonie. Thèse, UNC, IAC, CIRAD-BIOS-UMR AGAP, IRD. 367 p.

La Nouvelle-Calédonie est un archipel du Pacifique Sud-Ouest. Sa flore est riche, unique, et dysharmonique. L'origine temporelle et géographique de cette flore constitue une des problématiques majeures des botanistes. Une étude systématique a été menée sur le genre *Psychotria* (Rubiaceae), et ses genres alliés (clade Psychotrieae-Palicoureeae), afin de comprendre les modes d'établissement et de diversification des plantes dans l'archipel. Les deux tribus comportent 86 espèces néo-calédoniennes réparties entre les genres *Geophila* (une espèce), *Margaritopsis* (quatre espèces) et *Psychotria* (81 espèces). L'étude taxonomique a permis de déterminer pour chacun d'eux les noms d'espèces valides, et d'identifier 26 espèces nouvelles de *Psychotria* et *Margaritopsis*. Neuf combinaisons et noms spécifiques nouveaux sont proposés. La Nouvelle-Calédonie a été colonisée au moins quatre fois par les Psychotrieae-Palicoureeae. Bien que leurs arrivées soient simultanées durant le Néogène, ces quatre lignées ont des histoires évolutives différentes à mettre en lien avec leurs modes propres d'établissement et de diversification. Le genre *Geophila* n'a pas diversifié. Les *Margaritopsis* ont eu une diversification modeste, à l'image des autres espèces des îles du Pacifique. Les *Psychotria* clade NC1 constituent une lignée relique, ayant probablement subit une extinction, et qui se serait uniquement maintenue dans les maquis miniers. Les *Psychotria* clade NC2 constituent la plus large, jeune et rapide radiation de plantes de la Nouvelle-Calédonie, probablement originaire des forêts humides d'Australie. Le clade NC2 est en pleine expansion évolutive. Il est constitué de 12 lignées internes. Sa capacité à tolérer les substrats ultramafiques, acquise avant son arrivée dans l'archipel, a favorisé son établissement local. Sa large diversité a probablement différentes origines :

une labilité vis-à-vis de la nature des substrats géologiques, des changements éventuels de polliniseurs, un changement de niche écologique amorcé, lié à l'acquisition d'adaptations à la sécheresse et à l'avènement d'un climat plus aride en Nouvelle-Calédonie durant le Pliocène. (Résumé d'auteur)

Cirad-Agritrop Dk : 571415

89

Aleman, J. (2013)

Structure de la végétation en Afrique centrale : rôles des forçages anthropiques et naturels.

Thèse, UM2, CIRAD-ES-UPR BSef. 219 p.

La compréhension des facteurs qui déterminent la nature et la dynamique du couvert végétal en Afrique centrale représente un enjeu important face aux changements climatiques et à la pression sociale en cours. Forêt et savane sont souvent considérées comme deux états alternatifs stables et très contrastés, déterminés par de complexes interactions entre le couple sol-climat et les perturbations. Les liens actuels entre structure du couvert arboré et déterminants (déficit hydrique annuel, fréquence des feux, densité de population, intensité d'utilisation des terres et propriétés du sol) ont été caractérisés à l'aide d'images satellites, de bases de données mondiales et d'un modèle statistique. Il a ainsi été montré qu'il n'existe non pas un mais plusieurs états stables de savane. Pour les états de faible couvert arboré ($\leq 35\%$), ce sont principalement le type de sol et le climat qui déterminent leur présence et le passage de l'un à l'autre de ces états. Les savanes plus arborées ($> 35\%$) ainsi que les forêts semblent être les états les plus sensibles aux perturbations anthropiques. Cependant, ce modèle statistique ne décrit que les liens contemporains entre structure de la végétation et déterminants. En revanche, l'étude des bio-indicateurs environnementaux conservés dans des archives naturelles, et qui représente l'approche paléo-écologique, permet de reconstruire sur le temps long la végétation, les perturbations et certaines données climatiques, et ainsi obtenir une vision dynamique de leurs relations. Trois lacs, situés actuellement en forêt, en mosaïque de forêt et de savane, et en savane ont été étudiés. En comparant sédiments récents et images satellites, ainsi qu'en calibrant un modèle entre bio-indicateurs dans les sols et relevés de végétation, il a été possible de mieux comprendre ce qu'enregistrent les bio-indicateurs disponibles pour notre étude (phytolithes et charbons principalement) et donc d'estimer la structure de la végétation et l'activité de feux. Les résultats de ces études soulignent l'importance de bien cerner les processus taphonomiques pour reconstruire précisément les paléo-environnements. Les résultats préliminaires d'une paléo-séquence lacustre couvrant les 3000 dernières années sont présentés en discussion. Bien que l'environnement autour du lac soit resté une savane, cette dernière a subi des changements de structure important dus à la fois aux changements climatiques et aux modifications des régimes de feu. De plus, ces changements de structure ne semblent pas graduels, mais s'effectuent de façon abrupte, comme ils le sont actuellement le long du gradient climatique. Ces travaux prédisent donc une réponse critique des biomes tropicaux aux changements globaux en cours. (Résumé d'auteur)

Cirad-Agritrop Dk : 573948

8.3. Productions forestières, conservation des ressources forestières

90

Gond, V. (2013)

Forêts tropicales et télédétection. HDR, UEB, CIRAD-ES-UPR BSef. 191 p. + 1 diaporama (31 vues)

Caractériser les types de végétation a impliqué de nombreux groupes de recherche jusqu'à nos jours. Le regain d'intérêt pour cette thématique depuis quelques décennies est à mettre en parallèle avec les nouvelles questions associées aux changements globaux. La cartographie des types de végétation à partir de données satellitaires permet de mieux comprendre la structure et le fonctionnement des types de végétation complexes comme les forêts tropicales humides. La synthèse des travaux présentée dans ce document concerne une approche basée sur l'utilisation de séries temporelles de données satellitaires à basse résolution (entre 250 et 1000m) afin d'appréhender de larges portions de la surface terrestre de façon homogène sur de longues périodes (typiquement une décennie) et une approche basée sur l'utilisation de données à moyenne résolution (entre 5 et 30m) afin d'identifier les impacts humains sur les forêts tropicales humides. Ces deux approches combinées permettent d'établir au sein des massifs forestiers tropicaux (Amazonie, Afrique Centrale, Asie du Sud-est) des cartes d'états de surface basées sur l'analyse phénologique et de mettre au point des systèmes opérationnels rendant compte de la dégradation de ces forêts par les activités d'exploitation forestière et minière. Le document est divisé en trois volumes, le premier détaillant le curriculum vitae, le second

compliant les articles majeurs et le dernier argumentant la position scientifique et le projet actuel du candidat. (Résumé d'auteur)
Cirad-Agritrop Dk : 571072

91

Boissière, M., Locatelli, B., Sheil, D., Padmanaba, M., and Sadjudin, E. (2013)
Local perceptions of climate variability and change in tropical forests of Papua, Indonesia

Local perceptions of climate variability and change in tropical forests of Papua, Indonesia
Ecology and society vol.18:n°4, article 13

People everywhere experience changes and events that impact their lives. Knowing how they perceive, react, and adapt to climatic changes and events is helpful in developing strategies to support adaptation to climate change. Mamberamo in Papua, Indonesia, is a sparsely populated watershed of 7.8 million hectares possessing rich tropical forests. Our study compares scientific and traditional ecological knowledge (TEK) on climate, and analyzes how local people in Mamberamo perceive and react to climatic variations. We compared meteorological data for the region with local views gathered through focus group discussions and interviews in six villages. We explored the local significance of seasonality, climate variability, and climate change. Mamberamo is subject to strikingly low levels of climatic variation; nonetheless local people highlighted certain problematic climate-related events such as floods and droughts. As our results illustrate, the implications vary markedly among villages. People currently consider climate variation to have little impact on their livelihoods when contrasted with other factors, e.g., logging, mining, infrastructure development, and political decentralization. Nonetheless, increased salinity of water supplies, crop loss due to floods, and reduced hunting success are concerns in specific villages. To gain local engagement, adaptation strategies should initially focus on factors that local people already judge important. Based on our results we demonstrate that TEK, and an assessment of local needs and concerns, provide practical insights for the development and promotion of locally relevant adaptation strategies. These insights offer a foundation for further engagement. (Résumé d'auteur)

<http://dx.doi.org/10.5751/ES-05822-180413> Cirad-Agritrop Dk : 571241

Articles publiés dans une revue à facteur d'impact

8.3.1. Politique forestière et de l'environnement, gestion forestière et foncière

92

Maniatis, D., Tadoum, M., Crète, P., Aquino, A., Gari, J., Goodman, L., Bodin, B., Karsenty, A., Sembrés, T., and Fétiveau, J. (2014)

REDD+ : progress and challenges. In "The Forests of the Congo Basin - State of the Forest 2013. - Neufchâteau : Weyrich, 2014", pp. 121-162.

http://www.observatoire-comifac.net/docs/edf2013/EN/EDF2013_EN_chap5.pdf Cirad-Agritrop Dk : 574709

93

Bréda, N., and Mallet, B. (2013)

Les forêts, leurs biens et leurs services. In "S'adapter au changement climatique : agriculture, écosystèmes et territoires. - Versailles : Ed. Quae, 2013", pp. 125-140.

Cirad-Agritrop : CD_P40 SOU 16668; BA_P40 SOU 5747 Dk : 570832

94

Karsenty, A., Vogel, A., and Castell, F. (2014)

Carbon rights, REDD+ and payments for environmental services

Carbon rights, REDD+ and payments for environmental services

Environmental science and policy vol.35

Reducing Emissions from Deforestation and Forest Degradation (REDD+) has become a central dimension of the contemporary international forest regime. The mechanism seeks to reward actors for keeping or restoring forests as a means to reduce carbon emissions. Carbon rights, here understood as title to carbon credits, have an odd status in the REDD+ debate. They are closely associated with the belief that REDD+ will generate (economic) "rents" - i.e. revenues exceeding the full cost of the corresponding effort - which means framing the discussion in terms of entitlement to revenues beyond mere financial compensations. We suggest that, in an "ideal" REDD+ scheme, the possibility of obtaining rents in REDD+ would be very limited. In the real world, rent could be created by strategic behaviours by setting a reference emission level (what would occur under a business-as-usual

scenario) and by possible acceptance, for political reasons, of inappropriate rules such as being remunerated for the full stock of carbon. The carbon rights rhetoric leads to rent-seeking since remunerations could be disconnected from the active contribution to the production of emission reductions, which is a public good by nature. Another interpretation of carbon rights is the right to benefit from the sale of carbon credits, a framework within which what is at stake is sharing the benefits deriving from the human production and the sale of these benefits, a traditional social issue. In this case, we argue, the concept of carbon rights is useless and even misleading. Compensating for easements would be a more appropriate framework for designing incentive schemes such as payments for environmental services (PES). Reforming land tenure codes to allow individuals, families and communities to claim property or collective tenure rights on the land and the trees is the issue that matters in order to start tackling fairness in REDD+ and PES initiatives. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.envsci.2012.08.013> Cirad-Agritrop Dk : 571643

Articles publiés dans une revue à facteur d'impact

95

Maniatis, D., Tadoum, M., Crète, P., Aquino, A., Gari, J., Goodman, L., Bodin, B., Karsenty, A., Sembrés, T., and Fétiveau, J. (2014)

REDD+ : état d'avancement et défis à relever. In "Les forêts du bassin du Congo - Etat des forêts 2013. - Neufchâteau : Weyrich, 2014", pp. 121-162.

http://www.observatoire-comifac.net/docs/edf2013/FR/EDF2013_FR_chap5.pdf Cirad-Agritrop Dk : 574695

96

Jourdain, D., Boere, E., Van den Berg, M., Quang, D. D., Thanh, C. P., Affholder, F., and Pandey, S. (2014)

Water for forests to restore environmental services and alleviate poverty in Vietnam: A farm modeling approach to analyze alternative PES programs

Water for forests to restore environmental services and alleviate poverty in Vietnam: A farm modeling approach to analyze alternative PES programs

Land use policy vol.41

Most forested areas in South East Asia are located in mountainous areas, where they are reservoirs of biodiversity and have important watershed regulating functions. However, the continuing provision of these environmental services may be jeopardized by land use changes. To re-establish natural or productive forests, programs are being proposed in which participating farmers can set aside some of their cultivated sloping land and receive payment for maintaining the newly forested land. This paper compares two types of payments for ecosystems services (or PES)-type programs designed to favor reforestation by farming households: "Payments for forests" (PFF) and "Terraces for forests" (TFF). Both programs involve setting aside sloping land for reforestation but differ in the type and amount of compensation offered. PFF offers annual payments per area of retired land. TFF offers to cover the cost of converting a certain amount of a farm's sloping land into terraces, combined with annual payments per unit area of retired land. The main objective of the paper is to compare the two types of programs in terms of cost-efficiency - can we get the same amount of forest at lower cost? - and equity - will the poorest farmers participate? Using mathematical programming, we developed a set of farm models corresponding to typical farms in a mountainous district in Northern Vietnam. We simulated participation rates of different types of farms in the two types of PES programs. For each PES, we assessed the amount of land converted into forest, the cost of the program, and its impacts on land use and household revenues, at individual farm and village level. Results of our simulations showed that increasing access to irrigated terraces as a way of compensating for converting land to forest increased the participation of the poorest farmers and was more cost efficient than pure cash payments. This suggests that existing PFF programs are biased against the smallest landholders in the region whereas they could be transformed into win-win programs likely to increase forested areas and reduce inequalities among farm households. Our paper demonstrates that PES schemes, when fine-tuned to the South East Asian context, could not only be used to restore ecosystem services, but also to alleviate poverty. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.landusepol.2014.06.024> Cirad-Agritrop Dk : 573908

Articles publiés dans une revue à facteur d'impact

97

Thuy, P. T., Moeliono, M., Locatelli, B., Brockhaus, M., Di Gregorio, M., and Mardiah, S. (2014)

Integration of adaptation and mitigation in climate change and forest policies in Indonesia and Vietnam

Integration of adaptation and mitigation in climate change and forest policies in Indonesia and Vietnam
Forests vol.5:n°8

Forests play a major role in both climate change mitigation and adaptation, but few policies, if any, integrate these two aspects. Using Indonesia and Vietnam as case studies, we identify challenges at the national level but opportunities at the local level. Although both countries demonstrate political commitment to integrating adaptation and mitigation in their development plans, guidelines for policy and planning treat the two approaches separately. The main challenges identified are lack of knowledge, lack of political will, lack of financial incentives, and fragmentation of mandates and tasks of different government agencies. In contrast, at the local level, integration of mitigation and adaptation is facilitated by subnational autonomy, where mitigation projects might have adaptation co-benefits, and vice versa. Our results also show that many actors have a dual mandate that could bridge adaptation and mitigation if appropriate political and financial incentives are put in place. Successful integration of mitigation and adaptation policies would not only remove contradictions between policies, but also encourage governments that are designing domestic policies to exploit the potential for positive spillovers and realize the benefits of both approaches. (Résumé d'auteur)

<http://dx.doi.org/10.3390/f5082016> Cirad-Agritrop Dk : 574000

Articles publiés dans une revue à facteur d'impact

98

Lescuyer, G., Poufoun, J. N., Collin, A., and Yembe Yembe, R. (2014)

Le REDD+ à la rescousse des concessions forestières? Analyse financière des principaux modes de valorisation des terres dans le bassin du Congo : Document de Travail n°160, CIFOR, Jakarta. 21 p.

La forêt d'Afrique centrale subit depuis plusieurs années une pression accrue qui résulte de la combinaison de divers facteurs. Alors que l'exploitation forestière sous aménagement durable constituait le mode dominant de gestion de l'espace forestier depuis de nombreuses décennies, plusieurs activités concurrentes prennent une ampleur grandissante. C'est notamment le cas des agricultures industrielle et paysanne. Au Cameroun, à moyen terme, ce sont 10 concessions forestières, 14 réserves forestières et 6 parcs nationaux qui seront potentiellement impactés par l'extension des plantations agroindustrielles existant aujourd'hui. L'ampleur est plus faible au Congo avec seulement deux projets significatifs de promotion de la cacaoculture et de développement des palmiers à huile. De nombreux acteurs sont favorables à l'extension des cultures, même au détriment des forêts. Une des raisons qui expliquent cet engouement tient à la rentabilité financière de ce mode d'usage des terres : l'exploitation d'un hectare de forêt apparaît comme une activité largement moins rentable que la plupart des cultures de rente. Au cours actuel de la tonne de carbone sur les marchés internationaux, la mise en oeuvre d'un dispositif REDD+ dans les concessions ne modifie que marginalement la rentabilité financière de l'aménagement forestier : le mécanisme de REDD+ ne constitue pas aujourd'hui une approche permettant aux concessions forestières de mieux résister à ce type de pression agricole. (Résumé d'auteur)

http://www.cifor.org/publications/pdf_files/WPapers/WP160Lescuyer.pdf Cirad-Agritrop Dk : 574352

99

Lescuyer, G. (2013)

Sustainable forest management at the local scale: A comparative analysis of community forests and domestic forests in Cameroon

Sustainable forest management at the local scale: A comparative analysis of community forests and domestic forests in Cameroon

Small-scale forestry vol.12:n°1

In Cameroon, community forests are frequently presented as a relevant option to increase the welfare of rural populations and simultaneously improve local governance and forest resources conservation. But apart from community forests, rural livelihoods also depend on forest areas, designated as 'domestic forests' in this article, where local users enjoy informal customary rights. The specific contributions of community and domestic forests to the evolution of the prevailing socio-ecological system are assessed through a diachronic study of a village which is located in southern Cameroon. The Sustainable Livelihoods Framework is used to compare the progress of this social-ecological system between January 2008 and December 2009. The overall evolution of livelihoods was found to be positive during that period. In this case study, domestic forests and community forests are based on complementary models, which are often observed in southern Cameroon. Domestic forests

constitute the basis of socio-economic development, while community forests might offer opportunities for a local-level carbon sequestration payment mechanism. (Résumé d'auteur)
<http://dx.doi.org/10.1007/s11842-012-9199-x> Cirad-Agritrop Dk : 568855
Articles publiés dans une revue à facteur d'impact

100

Sist, P., Pacheco, P., Nasi, R., and Blaser, J. (2014)

Management of natural tropical forests in the past and present and projections for the future. In "Forests under pressure - Local responses to global issues / P. Katila, G. Galloway, W. de Jong, P. Pacheco, G. Mery (eds.). - Vienne : IUFRO, 2014. - (IUFRO World Series ; 32). - ISBN 978-3-902762-30-6", pp. 497-511.

Considering the increasing areas covered by tropical disturbed forests, it is clear that future conservation of biodiversity and tropical forest ecosystems will mostly take place within what we call here "anthropogenic" forests, and only if they are well-managed. The term "well-managed" means that the elastic capacity of a specific forest type is respected and the rules for logging and other forest use practices must be established to guarantee the perpetuation of forests in good conditions so that they provide all the services desired by society. Hence, tropical silviculture will have to play a major role in the future to ensure sustained and sustainable production of forest products. The first part of this chapter presents the concept of SFM of tropical forests, and the silvicultural practices to be implemented in the future in managed production forests. The second part discusses the diversity of actors involved in the management of tropical forests and the need to include these actors in SFM in the tropics. The third part reviews the shortcomings of current policies and discusses the move towards more integrated management perspectives as well as multi-level forest governance approaches. The last part examines the role of forest policies in promoting SFM in the tropics, taking into account the changing perception of sustainability, the technical constraints of tropical silviculture, and the need to involve multiple actors. (Résumé d'auteur)

http://www.iufro.org/download/file/11127/5581/ws32-PIV_ch02_Management_pdf/ Cirad-Agritrop Dk : 574468

101

Tsanga, R., Assembe-Mvondo, S., Lescuyer, G., Eba'a Atyi, R., and Béliné, V. (2013)

Gestion décentralisée des ressources forestières : revue des initiatives de foresterie communale dans les pays membres de la COMIFAC. In "Les politiques de décentralisation au Cameroun. - Paris : L'Harmattan, 2013", pp. 227-243.

La foresterie communale constitue l'une des options qui structure la gestion forestière en Afrique centrale. Le relatif échec de la foresterie communautaire et la désillusion de l'impact des revenus forestiers décentralisés sur le bien-être des populations locales ont réorienté le discours des partenaires au développement et de la société civile internationale vers la foresterie décentralisée, perçue comme une opportunité pour une gouvernance environnementale améliorée et le gage de la participation effective des populations locales à la gestion des ressources forestières. Le discours sur la foresterie décentralisée est séduisant non seulement en raison des opportunités qu'elle ouvre pour le développement local, mais surtout parce que la conjoncture internationale et les dynamiques sous régionales s'y prêtent au regard du discours global sur le changement climatique et le rôle que les collectivités publiques infra-étatiques pourraient jouer dans la mise en oeuvre du processus REDD+. (Résumé d'auteur)

Cirad-Agritrop Dk : 574608

102

Lescuyer, G., and Essoungou, J. N. (2013)

Gestion forestière multi-usages en Afrique centrale : perceptions, mises en oeuvre et évolutions

Gestion forestière multi-usages en Afrique centrale : perceptions, mises en oeuvre et évolutions
Bois et forêts des tropiques n°315 2011-11-15/2011-11-18

Quoique la gestion forestière multiusages (Gfm) soit promue par les codes forestiers d'Afrique centrale, cette approche reste mal comprise et peu mise en oeuvre pour les forêts de production et les forêts communautaires. L'article présente les résultats de 62 entretiens avec des personnes impliquées dans la gestion forestière au Cameroun, au Gabon et en République démocratique du Congo, et fait ressortir trois interprétations de la Gfm : une exploitation durable du bois intégrant secondairement les usages des autres acteurs ; une utilisation coutumière des ressources par les

populations locales ; une gestion planifiée et formelle de la diversité des biens et fonctions fournis par ces écosystèmes. L'analyse détaillée de huit études de cas montre en pratique que l'aménagement durable de la forêt se focalise presque toujours sur l'exploitation du bois ; quoique l'utilisation du gibier et la collecte des produits forestiers non ligneux soient systématiquement mentionnés dans les documents d'aménagement. À l'inverse, les services environnementaux - séquestration du carbone, protection des bassins versants - ou les biens publics y sont quasi absents. L'inscription de différents usages dans les documents de gestion ne suffit toutefois pas pour qu'ils soient toujours mis en oeuvre sur le terrain. Trois pistes sont explorées pour renforcer l'application de la Gfmu dans le bassin du Congo : concevoir la Gfmu à l'échelle du paysage et non à celle du massif forestier ; améliorer le contenu des documents d'aménagement forestier pour y inclure et valoriser l'ensemble des usages de la forêt ; renforcer le contrôle de l'application effective des documents de gestion, grâce à la certification ou à un meilleur contrôle du respect de la légalité. (Résumé d'auteur)

Cirad-Agritrop : CD_PE710; BA_PEBA872; RN_PERN113 Dk : 569243

Articles publiés dans une revue à facteur d'impact

103

Blanc, L. (2014)

La dynamique forestière : quels enseignements pour l'aménagement durable des forêts tropicales humides ? HDR, UAG, CIRAD-ES-UPR BSef. 81 p.

Cirad-Agritrop Dk : 574707

104

Marien, J.-N., Dubiez, E., Louppe, D., and Larzillière, A. (2013)

Quand la ville mange la forêt : Les défis du bois-énergie en Afrique centrale, Ed. Quae, Versailles. 238 p.

Présentation de l'éditeur : L'Afrique est confrontée à deux défis majeurs liés à l'augmentation extrêmement rapide de sa population : Comment fournir des aliments en quantités toujours plus abondantes et comment approvisionner ces populations en énergie nécessaire en particulier à la cuisson de ces aliments ? Ces enjeux dépassent largement le seul continent africain. D'une part, cela suppose d'agrandir les surfaces agricoles, souvent aux dépens de la forêt dont les sols sont les plus fertiles. D'autre part, le bois provenant de ces défriches agricoles est utilisé comme bois de feu ou transformé en charbon de bois. Avec le très fort accroissement des populations à nourrir, les jachères ne sont plus aussi longues, la terre s'appauvrit et le bois est de plus en plus rare : il faut aller toujours plus loin de la ville tentaculaire pour chercher nourriture et bois-énergie. Soutenu par l'Union européenne, le projet Makala " Gérer durablement la ressource bois-énergie en Afrique centrale " a été entrepris pour comprendre et quantifier ce problème et proposer des solutions afin d'enrayer ce cycle infernal de la dégradation de l'environnement et la difficulté des populations rurales et urbaines à s'approvisionner en énergie domestique. Les résultats de ce projet réalisé de 2009 à 2013, à Kinshasa et à Kinsangani en République démocratique du Congo et à Brazzaville en République du Congo, constituent le coeur de cet ouvrage. Sont présentés tout d'abord l'état de la consommation en bois-énergie des grandes villes, particulièrement du bassin d'approvisionnement de Kinshasa, puis des outils indispensables à une bonne gestion de la ressource en bois, donc utiles à la gestion des arbres et de la forêt. Ensuite, sont proposés les modèles de gestion de cette ressource élaborés dans le cadre de ce projet. Enfin, les auteurs élaborent des perspectives d'avenir et des pistes de réflexions afin d'apporter des réponses aux besoins en alimentation et en ressources en bois-énergie dans ces régions dans une optique de développement durable. Sommaire : Introduction. Le projet Makala : genèse et enjeux (Jean-Noël Marien). Partie 1 - Connaissance de la ressource. 1. La filière bois-énergie des villes de Kinshasa et Kisangani (RDC) (J. Schure, V. Ingram, S. Assembe-Mvondo, E. Mvula-Mampasi, J. Inzamba, P. Levang). 2. Evolution du couvert végétal et des stocks de carbone dans le bassin d'approvisionnement de Kinshasa (Marine Boulogne, Alexandre Pennec, Émilien Dubiez, Morgan Gigaud, Adrien Péroches, Jeanne Lavialle, Julia Rerolles, Pierre Proces, Régis Peltier, Jean-Noël Marien, Valéry Gond). Partie 2 - Les outils pour une gestion durable du bois-énergie à la périphérie des villes. 3. Les plans simples de gestion pour les ressources des communautés (Émilien Dubiez, Cédric Vermeulen, Adélaïde Larzillière, Pierre Proces, Simon Diwo, Timothée Yamba-Yamba, Baby Mvolo, Sabu Wakambo, Jean Inzamba, François Mubilayi Kabeya, Jean-Noël Marien). 4. Une démarche participative pour un partage des connaissances (A. Larzillière, C. Vermeulen, É. Dubiez, T. Yamba-Yamba, S. Diwo, G. Mumbere). 5. Sécuriser le statut foncier des plantations forestières villageoises (Philippe Karpe, Émilien Dubiez). 6. Amélioration de la carbonisation en meule traditionnelle (François Pinta, Émilien Dubiez, Dieudonné Kalala, Ghislaine

Volle, Dominique Louppe). 7. Perception locale des sols et de leur évolution chez les populations Batandu (Émilien Dubiez, Vincent Freycon, Timothée Yamba-Yamba, Baby Mvolo, Dominique Louppe). Partie 3 - La gestion durable de la ressource. 8. Forêts des communautés locales et gestion du bois-énergie (Cédric Vermeulen, Guillaume Lescuyer). 9. La régénération naturelle assistée, un outil pour rendre les jachères plus productives (Régis Peltier, Baptiste Marquant, Morgan Gigaud, Pierre Proces, Simon Diowo, Émilien Dubiez, Cédric Vermeulen, Adrien Péroches, Jean-Noël Marien). 10. Les plantations agroforestières d'Acacia auriculiformis de Mampu un système agroforestier innovant (Franck Bisiaux, Émilien Dubiez, José Ilanga-Lofonga, Louis Lebou, Simon Diowo, Samuel Lufungula, Sabu Mbomo-Wakambo, Dominique Louppe, Jean-Noël Marien, Vincent Freycon, Régis Peltier). 11. Réintroduire l'arbre dans le système cultural : succès et difficultés de l'agroforesterie villageoise (Franck Bisiaux, Simon Diowo, Samuel Lufungula, Sabu Mbomo-Wakambo, Jean-Pierre Mafinga, Pierre Matungulu, Louis Lebou, Émilien Dubiez, Dominique Louppe, Jean-Noël Marien). 12. Gestion durable de la ressource en bois-énergie en périphérie de Brazzaville : enjeux et perspectives (M. Nkoua, A. Saya). 13. Les essences forestières à charbon de bois aux environs de Kisangani (J.P. Mate-Mweru, M. Lusuna, H. Nshimba, L. Ndjele). 14. Planter des arbres en forêts naturelles : de la cueillette à la culture (Jean-Noël Marien). Partie 4 - Perspectives. 15. Redd+ et bois-énergie : entre régulation et incitations, les enjeux de développement durable (S. Ongolo, C. Pavageau, A. Madi). 16. Sécuriser la source de bois-énergie : de la réflexion à l'action (Jean-Noël Marien, Franck Bisiaux, Émilien Dubiez, Jean-Pierre Maté, Dominique Louppe, Régis Peltier, Jolien Schure, Méthode Nkoua, Cédric Vermeulen). 17. L'aménagement du territoire : gestion de la ressource en bois énergie (Jean-Philippe Tonneau, Émilien Dubiez, Bernard Mallet, Cédric Vermeulen, Jean-Noël Marien). 18. Biomasse-énergie en Afrique centrale : quelques éléments de prospective (Jean-Noël Marien). Postface (J.M. Dumond, M. Van Opstal)

Cirad-Agritrop : BA_P05 MAR 5717; BA_P05 MAR 5720 Dk : 569497

105

Purnomo, H., Guizol, P., Awang, S., Wardhana, W., Irawati, R. H., and Rennaldi, D. (2014)

Communicative action to level the playing field in forest plantations in Indonesia

Communicative action to level the playing field in forest plantations in Indonesia

Journal of sustainable forestry vol.33:n°4

The government of Indonesia allocated state land to private companies to establish forest plantations. However, ownership of this land was contested by some Sumatran communities. The plantation company, endorsed by the government, quickly developed a partnership to resolve the conflict, but this was unclear and inequitable. Action research was carried out to facilitate communication among stakeholders. This communicative action changed some perceptions and shared values began to emerge. A forum was established, which contributed to equitability producing a better partnership. This research is a model for empowering local communities in climate change, bioenergy, and food security negotiations. (Résumé d'auteur)

<http://dx.doi.org/10.1080/10549811.2014.888355> Cirad-Agritrop Dk : 574571

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

8.3.2. Mesure et estimation du carbone, de la biomasse, de la croissance relatives aux arbres et à la forêt, déforestation

106

Gaveau, D. L. A., Salim, M. A., Hergoualc'h, K., Locatelli, B., Sloan, S., Wooster, M., Marlier, M. E., Molidena, E., Yaen, H., Defries, R., Verchot, L., Murdiyarso, D., Nasi, R., Holmgren, P., and Sheil, D. (2014)

Major atmospheric emissions from peat fires in Southeast Asia during non-drought years: Evidence from the 2013 Sumatran fires

Major atmospheric emissions from peat fires in Southeast Asia during non-drought years: Evidence from the 2013 Sumatran fires

Scientific Reports vol.4:n°6112

Trans-boundary haze events in Southeast Asia are associated with large forest and peatland fires in Indonesia. These episodes of extreme air pollution usually occur during drought years induced by climate anomalies from the Pacific (El Niño Southern Oscillation) and Indian Oceans (Indian Ocean Dipole). However, in June 2013 - a non-drought year - Singapore's 24-hr Pollutants Standards Index reached an all-time record 246 (rated "very unhealthy"). Here, we show using remote sensing, rainfall records and other data, that the Indonesian fires behind the 2013 haze followed a two-month dry spell

in a wetter-than-average year. These fires were short-lived (one week) and limited to a localized area in Central Sumatra (1.6% of Indonesia): burning an estimated 163,336 ha, including 137,044 ha (84%) on peat. Most burning was confined to deforested lands (82%; 133,216 ha). The greenhouse gas (GHG) emissions during this brief, localized event were considerable: 172.659 Tg CO₂-eq (or 31.612 Tg C), representing 5-10% of Indonesia's mean annual GHG emissions for 2000-2005. Our observations show that extreme air pollution episodes in Southeast Asia are no longer restricted to drought years. We expect major haze events to be increasingly frequent because of ongoing deforestation of Indonesian peatlands. (Résumé d'auteur)

<http://dx.doi.org/10.1038/srep06112> Cirad-Agritrop Dk : 574008

Articles publiés dans une revue à facteur d'impact

107

Vieilledent, G., Grinand, C., and Vaudry, R. (2013)

Forecasting deforestation and carbon emissions in tropical developing countries facing demographic expansion: A case study in Madagascar

Forecasting deforestation and carbon emissions in tropical developing countries facing demographic expansion: A case study in Madagascar

Ecology and Evolution vol.3:n°6

Anthropogenic deforestation in tropical countries is responsible for a significant part of global carbon dioxide emissions in the atmosphere. To plan efficient climate change mitigation programs (such as REDD+, Reducing Emissions from Deforestation and forest Degradation), reliable forecasts of deforestation and carbon dioxide emissions are necessary. Although population density has been recognized as a key factor in tropical deforestation, current methods of prediction do not allow the population explosion that is occurring in many tropical developing countries to be taken into account. Here, we propose an innovative approach using novel computational and statistical tools, including R/GRASS scripts and the new phcfM R package, to model the intensity and location of deforestation including the effect of population density. We used the model to forecast anthropogenic deforestation and carbon dioxide emissions in five large study areas in the humid and spiny-dry forests of Madagascar. Using our approach, we were able to demonstrate that the current rapid population growth in Madagascar (+3.39% per year) will significantly increase the intensity of deforestation by 2030 (up to +1.17% per year in densely populated areas). We estimated the carbon dioxide emissions associated with the loss of aboveground biomass to be of 2.24 and 0.26 tons per hectare and per year in the humid and spiny-dry forest, respectively. Our models showed better predictive ability than previous deforestation models (the figure of merit ranged from 10 to 23). We recommend this approach to reduce the uncertainty associated with deforestation forecasts. We also underline the risk of an increase in the speed of deforestation in the short term in tropical developing countries undergoing rapid population expansion. (Résumé d'auteur)

<http://dx.doi.org/10.1002/ece3.550> Cirad-Agritrop Dk : 569457

Articles publiés dans une revue à facteur d'impact

108

Grinand, C., Rakotomalala, F., Gond, V., Vaudry, R., Bernoux, M., and Vieilledent, G. (2013)

Estimating deforestation in tropical humid and dry forests in Madagascar from 2000 to 2010 using multi-date Landsat satellite images and the random forests classifier

Estimating deforestation in tropical humid and dry forests in Madagascar from 2000 to 2010 using multi-date Landsat satellite images and the random forests classifier

Remote sensing of environment vol.139

High resolution and low uncertainty deforestation maps covering large spatial areas in tropical countries are needed to plan efficient forest conservation and management programs such as REDD+ (Reducing Emissions from Deforestation and Forest Degradation). Using an open-source free software (R, GRASS and QGis) and an original statistical approach combining multi-date land cover observations based on Landsat satellite images and the random forests classifier, we obtained up-to-date deforestation maps for the periods 2000-2005 and 2005-2010 with a minimum mapping unit of 0.36 ha for 7.7 M hectares, i.e. 40.3% of the tropical humid forest and 20.6% of the tropical dry forest in Madagascar. Uncertainty in deforestation on the maps was calculated by comparing the results of the classification to more than 30,000 visual interpretation points on a regular grid. We assessed accuracy on a per-pixel basis (confusion matrix) and by measuring the relative surface difference between wall-to-wall approach and point sampling. At the pixel level, user accuracy was 84.7% for stable land cover and 60.7% for land cover change. On average for the whole study area, we obtained a relative difference of 2% for stable land cover categories and 21.1% land cover change categories

respectively between the wall-to-wall and the point sampling approach. Depending on the study area, our conservative assessment of annual deforestation rates ranged from 0.93 to 2.33%·yr⁻¹ for the humid forest and from 0.46 to 1.17%·yr⁻¹ for the dry forest. Here we describe an approach to obtain deforestation maps with reliable uncertainty estimates that can be transposed to other regions in the tropical world. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.rse.2013.07.008> Cirad-Agritrop Dk : 570503

Articles publiés dans une revue à facteur d'impact

109

Pithon, S., Jubelin, G., Guitet, S., and Gond, V. (2013)

A statistical method for detecting logging-related canopy gaps using high-resolution optical remote sensing

A statistical method for detecting logging-related canopy gaps using high-resolution optical remote sensing

International Journal of Remote Sensing vol.34:n°2

In tropical rainforests, the sustainability of selective logging is closely linked to the extent of collateral stand damage. The capacity to measure the extent of such damage is essential for calculating carbon emissions due to forest degradation under the Reducing Emissions from Deforestation and Forest Degradation (REDD+) process. The use of remote sensing to detect canopy gaps in tropical rainforests is an attractive alternative to ground surveys, which are laborious and imprecise. In French Guiana, the detection of logging-related gaps using very high spatial resolution optical satellite images produced by the Système Pour l'Observation de la Terre (SPOT) 5 sensor is carried out by Office National des Forêts (ONF) (French National Forestry Agency). Gaps are detected using a segmentation method based on computer-assisted photointerpretation. Detection has been automated to improve and accelerate the process. We developed an automatic method, which involves estimating segmentation thresholds using a statistical approach. The principle of the method presented in this article is to model the forest's spectral signature by using a Gaussian distribution and calculate a divergence between that theoretical signature and the image histogram in order to detect gaps that constitute a reduction of forest cover. The segmentation threshold between gap and forest is thus no longer defined in the original radiometric area but as a discrepancy between theoretical distribution and histogram. Computing the divergence to define the threshold made it possible to efficiently automate the detection of all gaps and skid trails with a surface area greater than 100 m². The proportion of misclassified points measured during field surveys is 12%, which is a high level of precision. The proportion of misclassified points obtained is 12%. This tool could be used to assess the quality of logging operations or biomass loss in other areas where the forest is undergoing deterioration while still remaining predominant in the landscape. (Résumé d'auteur)

<http://dx.doi.org/10.1080/01431161.2012.706719> Cirad-Agritrop Dk : 565584

Articles publiés dans une revue à facteur d'impact

110

Mortier, F., Gourlet-Fleury, S., Ouédraogo, D., Picard, N., and Rossi, V. (2014)

Impact of anthropogenic and climatic changes on biomass and diversity of the Central African forests, from local to global scale: original methods for new results

Impact of anthropogenic and climatic changes on biomass and diversity of the Central African forests, from local to global scale: original methods for new results

Geophysical research abstracts vol.16 2014-04-27/2014-05-02

Forests of the Congo Basin, the second most important remaining block of tropical moist forest in the world, are facing increasing anthropogenic pressure and climate change. Understanding the biomass and diversity dynamics under these pressures is one major challenge for African nations and international communities. This talk aims to present original methods to model, infer, and predict growth, biomass and diversity of Central African forests, as well as new results on the impacts of global change on those forests, at various scales. With respect to methods, we will present theoretical frameworks allowing (i) to model growth processes in species-rich ecosystems like tropical rain forests, (ii) to take into account uncertainties in biomass estimation. In terms of results, we will highlight at a local scale, how human activities as well as climatic variations would impact (i) the composition and diversity of forests, (ii) the dynamics of biomass and growth processes. At a global scale, we will demonstrate how environmental filtering controls the above ground biomass. The number of studies are currently increasing over the Congo Basin through several research projects led

by our team (CoForTips, DynAfFor) and contributing to various international organization's programs (Cifor, FAO, Comifac, Ofac). (Texte intégral)

<http://meetingorganizer.copernicus.org/EGU2014/EGU2014-16554.pdf> Cirad-Agritrop Dk : 574577

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

111

Vennetier, M., Girard, F., Taugourdeau, O., Cailleret, M., Caraglio, Y., Sabatier, S.-A., Ouarmim, S., Cody, D., and Thabeet, A. (2013)

Climate change impact on tree architectural development and leaf area. In "Climate change - realities, impacts over ice cap, sea level and risks. - Rijeka : InTech, 2013", pp. 103-126.

<http://dx.doi.org/10.5772/51510> Cirad-Agritrop : CD_P40 SIN 16512 Dk : 569929

112

Stahl, C., Burban, B., Wagner, F., Goret, J.-Y., Bompy, F., and Bonnal, D. (2013)

Influence of seasonal variations in soil water availability on gas exchange of tropical canopy trees

Influence of seasonal variations in soil water availability on gas exchange of tropical canopy trees

Biotropica vol.45:n°2

Seasonal variations in environmental conditions influence the functioning of the whole ecosystem of tropical rain forests, but as yet little is known about how such variations directly influence the leaf gas exchange and transpiration of individual canopy tree species. We examined the influence of seasonal variations in relative extractable water in the upper soil layers on predawn leaf water potential, saturated net photosynthesis, leaf dark respiration, stomatal conductance, and tree transpiration of 13 tropical rain forest canopy trees (eight species) over 2 yr in French Guiana. The canopies were accessed by climbing ropes attached to the trees and to a tower. Our results indicate that a small proportion of the studied trees were unaffected by soil water depletion during seasonal dry periods, probably thanks to efficient deep root systems. The trees showing decreased tree water status (i.e., predawn leaf water potential) displayed a wide range of leaf gas exchange responses. Some trees strongly regulated photosynthesis and transpiration when relative extractable water decreased drastically. In contrast, other trees showed little variation, thus indicating good adaptation to soil drought conditions. These results have important applications to modeling approaches: indeed, precise evaluation and grouping of these response patterns are required before any tree-based functional models can efficiently describe the response of tropical rain forest ecosystems to future changes in environmental conditions. (Résumé d'auteur)

<http://dx.doi.org/10.1111/j.1744-7429.2012.00902.x> Cirad-Agritrop Dk : 569475

Articles publiés dans une revue à facteur d'impact

113

Wagner, F., Rossi, V., Baraloto, C., Bonal, D., Stahl, C., and Hérault, B. (2014)

Are commonly measured functional traits involved in tropical tree responses to climate?

Are commonly measured functional traits involved in tropical tree responses to climate?

International Journal of Ecology vol.1:n°ID 389409

<http://dx.doi.org/10.1155/2014/389409> Cirad-Agritrop Dk : 574383

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

114

Wagner, F., Rossi, V., Aubry-Kientz, M., Bonal, D., Dalitz, H., Gliniars, R., Stahl, C., Trabucco, A., and Hérault, B. (2014)

Pan-tropical analysis of climate effects on seasonal tree growth

Pan-tropical analysis of climate effects on seasonal tree growth

PLoS One vol.9:n°3

Climate models predict a range of changes in tropical forest regions, including increased average temperatures, decreased total precipitation, reduced soil moisture and alterations in seasonal climate variations. These changes are directly related to the increase in anthropogenic greenhouse gas concentrations, primarily CO₂. Assessing seasonal forest growth responses to climate is of utmost importance because woody tissues, produced by photosynthesis from atmospheric CO₂, water and light, constitute the main component of carbon sequestration in the forest ecosystem. In this paper, we combine intraannual tree growth measurements from published tree growth data and the corresponding monthly climate data for 25 pan-tropical forest sites. This meta-analysis is designed to find the shared climate drivers of tree growth and their relative importance across pan-tropical forests

in order to improve carbon uptake models in a global change context. Tree growth reveals significant intra-annual seasonality at seasonally dry sites or in wet tropical forests. Of the overall variation in tree growth, 28.7% was explained by the site effect, i.e. the tree growth average per site. The best predictive model included four climate variables: precipitation, solar radiation (estimated with extrasolar radiation reaching the atmosphere), temperature amplitude and relative soil water content. This model explained more than 50% of the tree growth variations across tropical forests. Precipitation and solar radiation are the main seasonal drivers of tree growth, causing 19.8% and 16.3% of the tree growth variations. Both have a significant positive association with tree growth. These findings suggest that forest productivity due to tropical tree growth will be reduced in the future if climate extremes, such as droughts, become more frequent. (Résumé d'auteur)

<http://dx.doi.org/10.1371/journal.pone.0092337> Cirad-Agritrop Dk : 573189

Articles publiés dans une revue à facteur d'impact

115

Ouédraogo, D., Mortier, F., Gourlet-Fleury, S., Freycon, V., and Picard, N. (2013)

Slow-growing species cope best with drought: Evidence from long-term measurements in a tropical semi-deciduous moist forest of Central Africa

Slow-growing species cope best with drought: Evidence from long-term measurements in a tropical semi-deciduous moist forest of Central Africa

Journal of Ecology vol.101:n°6

1. Understanding how drought affects annual tree growth in tropical forests is of crucial importance to predict their response to climate change. Previous studies, mainly led in the Neotropics and in Southeast Asia, have yielded contradictory results which might be explained by differences in species studied, in the tree development stages considered, or by differences in other environmental factors than water availability. 2. Here, we described the growth responses of functional groups of tree species to drought in a Central African semi-deciduous moist forest. Species groups were automatically defined using a finite mixture model, which grouped species according to their growth model parameters. The growth model considered the variation in species response to drought, and the effect of competition for resources and of tree development stage on growth. Groups were further characterized by species functional traits. Nine species groups were identified. They differed in their ability to acquire, use and conserve resources, as suggested by their differences in maximum growth rate, regeneration guild, maximum dbh, wood density and leaf habit. The species were organized along a light requirement gradient that here closely matched a broader continuum of plant strategies for resource use, from slow-growing shade-tolerant conservative species to fast-growing pioneer acquisitive species. 3. Tree growth decreased with drought intensity, and species drought tolerance was found to be related to resource use strategy: slow-growing species using a conservative strategy were the least sensitive to variations in water availability, while fast-growing species using an acquisitive strategy were the most sensitive. 4. Synthesis. Shade-tolerant species, characterized by a low potential growth rate and thus a conservative strategy of resource use, were found to be the least sensitive to drought. This supports the hypothesis of a single axis summarizing multiple traits that represents a general trade-off between the conservation and rapid acquisition of resources. (Résumé d'auteur)

<http://dx.doi.org/10.1111/1365-2745.12165> Cirad-Agritrop Dk : 571340

Articles publiés dans une revue à facteur d'impact

116

Le Clec'h, S., Oszwald, J., Jégou, N., Dufour, S., Cornillon, P. A., Miranda, I. d. S., Gonzaga, L., Grimaldi, M., Gond, V., and Arnauld de Sartre, X. (2013)

Cartographier le carbone stocké dans la végétation : perspectives pour la spatialisation d'un service écosystémique

Cartographier le carbone stocké dans la végétation : perspectives pour la spatialisation d'un service écosystémique

Bois et forêts des tropiques n°316

Les grands programmes internationaux d'observation des écosystèmes, tels que le Millennium Ecosystem Assessment (Mea), puis Redd (Réduction des émissions liées à la déforestation et à la dégradation des forêts) et Redd+, préconisent le développement des approches permettant de quantifier et de spatialiser les services écosystémiques afin de mettre en oeuvre des pratiques et des politiques de gestion environnementale plus adaptées. La cartographie des services écosystémiques apparaît ainsi comme un outil majeur des espaces à forts enjeux environnementaux. Cependant, elle souffre encore de certaines limitations. C'est le cas du stock de carbone dans la biomasse végétale. À

l'échelle d'une localité d'Amazonie brésilienne de 175 km², cette fonction écologique a été cartographiée avec une résolution spatiale de 30 x 30 m. Afin de quantifier ces stocks, des mesures de biomasse arborée et arbustive au sein de 45 " points " et des données géographiques obtenues par télédétection sont mises en jeu. Pour cela, deux méthodes statistiques sont testées : l'arbre de décision et la régression linéaire multiple. Les résultats statistiques de chacune de ces méthodes sont présentés, permettant d'en comprendre les intérêts et les inconvénients. La qualité d'ajustement de ces modèles est testée. Si l'arbre de décision décrit mieux le rôle des variables explicatives, la régression linéaire multiple permet une prédiction beaucoup plus efficace. Elle rend alors davantage compte de la variabilité spatiale au sein de chaque type d'occupation du sol. Cette méthode fait apparaître à l'échelle de la ferme des phénomènes spécifiques au territoire étudié. Cela permet de retranscrire simplement le résultat d'un processus écologique tout en le mettant en relation avec les activités anthropiques. Cette étude permet donc d'illustrer l'importance des choix méthodologiques afin d'obtenir la cartographie d'un processus. (Résumé d'auteur)

Cirad-Agritrop : CD_PE710; BA_PEBA872; RN_PERN113 Dk : 570428

Articles publiés dans une revue à facteur d'impact

117

Chave, J., Rejou-Mechain, M., Burquez, A., Chidumayo, E. N., Colgan, M. S., Delitti, W. B. C., Duque, A., Eid, T., Fearnside, P. M., Goodman, R. C., Henry, M., Martinez-Yrizar, A., Mugasha, W. A., Muller-Landau, H. C., Mencuccini, M., Nelson, B. N., Ngomanda, A., Nogueira, E. M., Ortiz-Malavassi, E., Pélissier, R., Ploton, P., Ryan, C. M., Saldarriaga, J. G., and Vieilledent, G. (2014)

Improved allometric models to estimate the aboveground biomass of tropical trees

Improved allometric models to estimate the aboveground biomass of tropical trees

Global change biology vol.20:n°10

Terrestrial carbon stock mapping is important for the successful implementation of climate change mitigation policies. Its accuracy depends on the availability of reliable allometric models to infer oven-dry aboveground biomass of trees from census data. The degree of uncertainty associated with previously published pantropical aboveground biomass allometries is large. We analyzed a global database of directly harvested trees at 58 sites, spanning a wide range of climatic conditions and vegetation types (4004 trees = 5 cm trunk diameter). When trunk diameter, total tree height, and wood specific gravity were included in the aboveground biomass model as covariates, a single model was found to hold across tropical vegetation types, with no detectable effect of region or environmental factors. The mean percent bias and variance of this model was only slightly higher than that of locally fitted models. Wood specific gravity was an important predictor of aboveground biomass, especially when including a much broader range of vegetation types than previous studies. The generic tree diameter-height relationship depended linearly on a bioclimatic stress variable E, which compounds indices of temperature variability, precipitation variability, and drought intensity. For cases in which total tree height is unavailable for aboveground biomass estimation, a pantropical model incorporating wood density, trunk diameter, and the variable E outperformed previously published models without height. However, to minimize bias, the development of locally derived diameter-height relationships is advised whenever possible. Both new allometric models should contribute to improve the accuracy of biomass assessment protocols in tropical vegetation types, and to advancing our understanding of architectural and evolutionary constraints on woody plant development. (Résumé d'auteur)

<http://dx.doi.org/10.1111/gcb.12629> Cirad-Agritrop Dk : 574132

Articles publiés dans une revue à facteur d'impact

118

Baraloto, C., Molto, Q., Rabaud, S., Hérault, B., Valencia, R., Blanc, L., Fine, P. V. A., and Thompson, J. (2013)

Rapid simultaneous estimation of aboveground biomass and tree diversity across neotropical forests: A comparison of field Inventory methods

Rapid simultaneous estimation of aboveground biomass and tree diversity across neotropical forests: A comparison of field Inventory methods

Biotropica vol.45:n°3

A standardized rapid inventory method providing information on both tree species diversity and aboveground carbon stocks in tropical forests will be an important tool for evaluating efforts to conserve biodiversity and to estimate the carbon emissions that result from deforestation and degradation (REDD). Herein, we contrast five common plot methods differing in shape, size, and effort requirements to estimate tree diversity and aboveground tree biomass (AGB). We simulated the methods across six Neotropical forest sites that represent a broad gradient in forest structure, tree

species richness, and floristic composition, and we assessed the relative performance of methods by evaluating the bias and precision of their estimates of AGB and tree diversity. For a given sample of forest area, a 'several small' (< 1 ha) sampling strategy led to a smaller coefficient of variation (CV) in the estimate of AGB than a 'few large' one. The effort (person-days) required to achieve an accurate AGB estimate (< 10% CV), however, was greater for the smallest plots (0.1 ha) than for a compromise approach using 0.5 ha modified Gentry plots, which proved to be the most efficient method to estimate AGB across all forest types. Gentry plots were also the most efficient at providing accurate estimates of tree diversity (< 10% CV of Hill number). We recommend the use of the 0.5 ha modified Gentry plot method in future rapid inventories, and we discuss a set of criteria that should inform any choice of inventory method. (Résumé d'auteur)

<http://dx.doi.org/10.1111/btp.12006> Cirad-Agritrop Dk : 569829

Articles publiés dans une revue à facteur d'impact

119

Slik, J. W. F., Paoli, G., McGuire, K. L., Amaral, I., Barroso, J., Bastian, M., Blanc, L., Bongers, F., Boundja, P., Clark, C. J., Collins, M., Dauby, G., Ding, Y., Doucet, J.-L., Eler, E., Ferreira, L., Forshed, O., Fredriksson, G., Gillet, J.-F., Harris, D., Leal, M., Laumonier, Y., Malhi, Y., Mansor, A., Martin, E., Miyamoto, K., Araujo-Murakami, A., Nagamasu, H., Nilus, R., Nurtjahya, E., Oliveira, A., Onrizal, O., Parada-Gutierrez, A., Permana, A., Poorter, L., Poulsen, J. R., Ramirez-Angulo, H., Reitsma, J., Rovero, F., Rozak, A., Sheil, D., Silva-Espejo, J., Silveira, M., Spironelo, W., Ter Steege, H., Stévart, T., Navarro-Aguilar, G. E., Sunderland, T. C. H., Suzuki, E., Tang, J., Theilade, I., Van Der Heijden, G., Van Valkenburg, J., Do, T. V., Vilanova, E., Vos, V., Wich, S., Wöll, H., Yoneda, T., Zang, R., Zhang, M.-G., and Zweifel, N. (2013)

Large trees drive forest aboveground biomass variation in moist lowland forests across the tropics

Large trees drive forest aboveground biomass variation in moist lowland forests across the tropics
Global Ecology and Biogeography vol.22:n°12

Aim Large trees (d.b.h.??70?cm) store large amounts of biomass. Several studies suggest that large trees may be vulnerable to changing climate, potentially leading to declining forest biomass storage. Here we determine the importance of large trees for tropical forest biomass storage and explore which intrinsic (species trait) and extrinsic (environment) variables are associated with the density of large trees and forest biomass at continental and pan-tropical scales. Location Pan-tropical. Methods Aboveground biomass (AGB) was calculated for 120 intact lowland moist forest locations. Linear regression was used to calculate variation in AGB explained by the density of large trees. Akaike information criterion weights (AICc-wi) were used to calculate averaged correlation coefficients for all possible multiple regression models between AGB/density of large trees and environmental and species trait variables correcting for spatial autocorrelation. Results Density of large trees explained c. 70% of the variation in pan-tropical AGB and was also responsible for significantly lower AGB in Neotropical [287.8 (mean)?±?105.0 (SD) Mg ha?1] versus Palaeotropical forests (Africa 418.3?±?91.8 Mg ha?1; Asia 393.3?±?109.3 Mg ha?1). Pan-tropical variation in density of large trees and AGB was associated with soil coarseness (negative), soil fertility (positive), community wood density (positive) and dominance of wind dispersed species (positive), temperature in the coldest month (negative), temperature in the warmest month (negative) and rainfall in the wettest month (positive), but results were not always consistent among continents. Main conclusions Density of large trees and AGB were significantly associated with climatic variables, indicating that climate change will affect tropical forest biomass storage. Species trait composition will interact with these future biomass changes as they are also affected by a warmer climate. Given the importance of large trees for variation in AGB across the tropics, and their sensitivity to climate change, we emphasize the need for in-depth analyses of the community dynamics of large trees. (Résumé d'auteur)

<http://dx.doi.org/10.1111/geb.12092> Cirad-Agritrop Dk : 571562

Articles publiés dans une revue à facteur d'impact

120

Ndjondo, M., Gourlet-Fleury, S., Manlay, R., Engone Obiang, N. L., Ngomanda, A., Romero , C., Claeys, F., and Picard, N. (2014)

Opportunity costs of carbon sequestration in a forest concession in central Africa

Opportunity costs of carbon sequestration in a forest concession in central Africa

Carbon balance and management vol.9:n°4

Background: A large proportion of the tropical rain forests of central Africa undergo periodic selective logging for timber harvesting. The REDD+ mechanism could promote less intensive logging if revenue

from the additional carbon stored in the forest compensates financially for the reduced timber yield. Results: Carbon stocks, and timber yields, and their associated values, were predicted at the scale of a forest concession in Gabon over a project scenario of 40 yr with reduced logging intensity. Considering that the timber contribution margin (i.e. the selling price of timber minus its production costs) varies between 10 and US\$40 m?3, the minimum price of carbon that enables carbon revenues to compensate forgone timber benefits ranges between US\$4.4 and US\$25.9/tCO2 depending on the management scenario implemented. Conclusions: Where multiple suppliers of emission reductions compete in a REDD+ carbon market, tropical timber companies are likely to change their management practices only if very favourable conditions are met, namely if the timber contribution margin remains (Résumé d'auteur)

<http://dx.doi.org/10.1186/s13021-014-0004-3> Cirad-Agritrop Dk : 573803

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

121

Sist, P., Mazzei, L., Blanc, L., and Rutishauser, E. (2014)

Large trees as key elements of carbon storage and dynamics after selective logging in the Eastern Amazon

Large trees as key elements of carbon storage and dynamics after selective logging in the Eastern Amazon

Forest ecology and management vol.318

The long term effect of Reduced-Impact Logging (RIL) on above-ground live biomass (AGB) dynamics was investigated in 18 1-ha logged over permanent sample plots set up in a terra firme rain forest in the Eastern Amazon (Brazil, Paragominas). Both tree survival and growth were investigated among three Diameter at Breast Height (DBH) classes (20-40, 40-60, P60 cm) to assess the contribution of each DBH class to the post-logging AGB recovery. Before logging, mean tree density and AGB per plot (dbhP20 cm) were 187 ± 14 trees ha₋₁ and 377.6 ± 62.8 Mg ha₋₁ respectively. Although big trees (dbhP60 cm) only represented 9.3% of the total tree density, they gathered almost half of total AGB. During the post-logging period (8 years), the mortality of large trees was found to drive the annual net changes and largely overcame the AGB gain in the smaller DBH classes. Indeed, plots with high post-logging mortality of large trees showed negative carbon balance t over the study period (8 years). The over mortality of large trees injured by logging contributed significantly to the annual AGB losses (up to 40%) in the first years after logging. Due to the overwhelming importance of this size class in carbon stocks and dynamic, reducing logging damages and intensity might have great impact in the post-logging biomass dynamics. We estimated that reducing logging intensity from 6 to 3 stems ha₋₁ would save 27.7 Mg C ha₋₁ for a 35 years rotation cycle. To compensate this loss of profits, compensatory payments of avoided CO₂ emission should worth US \$ 6.5/Mg of CO₂. This price falls into the range of prices of the international carbon market. Sustainable forest management aiming at enhancing carbon stocks could therefore promote the preservation of the large trees. At our study site, we recommend the adoption of a maximum diameter cutting limit of 110 cm. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.foreco.2014.01.005> Cirad-Agritrop Dk : 573468

Articles publiés dans une revue à facteur d'impact

122

Molto, Q., Hérault, B., Boreux, J. J., Daublet, M., Rousteau, A., and Rossi, V. (2014)

Predicting tree heights for biomass estimates in tropical forests - a test from French Guiana

Predicting tree heights for biomass estimates in tropical forests - a test from French Guiana

Biogeosciences vol.11:n°12

The recent development of REDD+ mechanisms requires reliable estimation of carbon stocks, especially in tropical forests that are particularly threatened by global changes. Even though tree height is a crucial variable for computing aboveground forest biomass (AGB), it is rarely measured in large-scale forest censuses because it requires extra effort. Therefore, tree height has to be predicted with height models. The height and diameter of all trees over 10 cm in diameter were measured in 33 half-hectare plots and 9 one-hectare plots throughout northern French Guiana, an area with substantial climate and environmental gradients. We compared four different model shapes and found that the Michaelis-Menten shape was most appropriate for the tree biomass prediction. Model parameter values were significantly different from one forest plot to another, and this leads to large errors in biomass estimates. Variables from the forest stand structure explained a sufficient part of plot-to-plot variations of the height model parameters to improve the quality of the AGB predictions. In the forest stands dominated by small trees, the trees were found to have rapid height growth for small

diameters. In forest stands dominated by larger trees, the trees were found to have the greatest heights for large diameters. The aboveground biomass estimation uncertainty of the forest plots was reduced by the use of the forest structure-based height model. It demonstrated the feasibility and the importance of height modeling in tropical forests for carbon mapping. When the tree heights are not measured in an inventory, they can be predicted with a height-diameter model and incorporating forest structure descriptors may improve the predictions. (Résumé d'auteur)

<http://dx.doi.org/10.5194/bg-11-3121-2014> Cirad-Agritrop Dk : 574389

Articles publiés dans une revue à facteur d'impact

123

Molto, Q., Hérault, B., Boreux, J. J., Daullat, M., Rousteau, A., and Rossi, V. (2013)

Predicting tree heights for biomass estimates in tropical forests

Predicting tree heights for biomass estimates in tropical forests

Biogeosciences Discussions vol.10:n°5

The recent development of REDD+ mechanisms require reliable estimation of carbon stocks, especially in tropical forests that are particularly threatened by global changes. Even if tree height is a crucial variable to compute the above-ground forest biomass, tree heights are rarely measured in large-scale forest census because it requires consequent extra-effort. Tree height have thus to be predicted thanks to height models. Height and diameter of all trees above 10 cm of diameter were measured in thirty-three half-ha plots and nine one-ha plots throughout the northern French Guiana, an area with substantial climate and environmental gradients. We compared four different model shapes and found that the Michaelis-Menten shape was the most appropriate for the tree biomass prediction. Model parameters values were significantly different from one forest plot to another and neglecting these differences would lead to large errors in biomass estimates. Variables from the forest stand structure explained a sufficient part of the plot-to-plot variations of the height model parameters to affect the AGB predictions. In the forest stands dominated by small trees, the trees were found to have rapid height growth for small diameters. In forest stands dominated by larger trees, the trees were found to have the greatest heights for large diameters. The above-ground biomass estimation uncertainty of the forest plots was reduced by the use of the forest structure-based height model. It demonstrates the feasibility and the importance of height modeling in tropical forest for carbon mapping. Tree height is definitely an important variable for AGB estimations. When the tree heights are not measured in an inventory, they can be predicted with a height-diameter model. This model can account for plot-to plot variations in height-diameter relationship thank to variables describing the plots. The variables describing the stand structure of the plots are efficient for this. We found that variables describing the plot environment (rainfall, topography,...) do not improve the model much. (Résumé d'auteur)

<http://dx.doi.org/10.5194/bgd-10-8611-2013> Cirad-Agritrop Dk : 570598

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

124

Wagner, F., Rossi, V., Stahl, C., Bonnal, D., and Hérault, B. (2013)

Asynchronism in leaf and wood production in tropical forests: A study combining satellite and ground-based measurements

Asynchronism in leaf and wood production in tropical forests: A study combining satellite and ground-based measurements

Biogeosciences Discussions vol.10:n°5

The fixation of carbon in tropical forests mainly occurs through the production of wood and leaves, both being the principal components of net primary production. Currently field and satellite observations are independently used to describe the forest carbon cycle, but the link between satellite-derived forest phenology and field-derived forest productivity remains opaque. We used a unique combination of a MODIS EVI dataset, a climate-explicit wood production model and direct litterfall observations at an intra-annual time scale in order to question the synchronism of leaf and wood production in tropical forests. Even though leaf and wood biomass fluxes had the same range (respectively $2.4 \pm 1.4 \text{ Mg C ha}^{-1}\text{yr}^{-1}$ and $2.2 \pm 0.4 \text{ Mg C ha}^{-1}\text{yr}^{-1}$), they occurred separately in time. EVI increased with the magnitude of leaf renewal at the beginning of the dry season when solar irradiance was at its maximum. At this time, wood production stopped. At the onset of the rainy season when new leaves were fully mature and water available again, wood production quickly increased to reach its maximum in less than a month, reflecting a change in carbon allocation from short lived pools (leaves) to long lived pools (wood). The time lag between peaks of EVI and wood production (109 days) revealed a substantial decoupling between the irradiance-driven leaf renewal and the water-

driven wood production. Our work is a first attempt to link EVI data, wood production and leaf phenology at a seasonal time scale in a tropical evergreen rainforest and pave the way to develop more sophisticated global carbon cycle models in tropical forests. (Résumé d'auteur)

<http://dx.doi.org/10.5194/bgd-10-8247-2013> Cirad-Agritrop Dk : 569476

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

125

Rejou-Mechain, M., Muller-Landau, H. C., Detto, M., Thomas, S. C., Le Toan, T., Saatchi, S., Barreto-Silva, J. S., Bourg, N. A., Bunyavejchewin, S., Butt, N., Brockelman, W. Y., Cao, M., Cardenas, D., Chiang, J. M., Chuyong, G. B., Clay, K., Condit, R., Dattaraja, H. S., Davies, S. J., Duque, A., Esufali, S., Ewango, C., Fernando, R. H. S., Fletcher, C. D., Gunatilleke, I. A. U. N., Hao, Z., Harms, K. E., Hart, T. B., Hérault, B., Howe, R. W., Hubbell, S. P., Johnson, D. J., Kenfack, D., Larson, A. J., Lin, L., Lin, Y., Lutz, J. A., Makana, J.-R., Malhi, Y., Marthews, T. R., McEwan, R. W., McMahon, S. M., McShea, W. J., Muscarella, R., Nathalang, A., Noor, N. S. M., Nyctch, C. J., Oliveira, A. A., Phillips, R. P., Pongpattananurak, N., Punchi-Manage, R., Salim, R., Schurman, J., Sukumar, R., Suresh, H. S., Suwanvecho, U., Thomas, D. W., Thompson, J., Uríarte, M., Valencia, R., Vicentini, A., Wolf, A. T., Yap, S., Yuan, Z., Zartman, C. E., Zimmerman, J. K., and Chave, J. (2014)

Local spatial structure of forest biomass and its consequences for remote sensing of carbon stocks

Local spatial structure of forest biomass and its consequences for remote sensing of carbon stocks

Biogeosciences vol.11

Advances in forest carbon mapping have the potential to greatly reduce uncertainties in the global carbon budget and to facilitate effective emissions mitigation strategies such as REDD+. Though broad scale mapping is based primarily on remote sensing data, the accuracy of resulting forest carbon stock estimates depends critically on the quality of field measurements and calibration procedures. The mismatch in spatial scales between field inventory plots and larger pixels of current and planned remote sensing products for forest biomass mapping is of particular concern, as it has the potential to introduce errors, especially if forest biomass shows strong local spatial variation. Here, we used 30 large (8-50 ha) globally distributed permanent forest plots to quantify the spatial variability in aboveground biomass (AGB) at spatial grains ranging from 5 to 250 m (0.025-6.25 ha), and we evaluate the implications of this variability for calibrating remote sensing products using simulated remote sensing footprints. We found that the spatial sampling error in AGB is large for standard plot sizes, averaging 46.3% for 0.1 ha subplots and 16.6% for 1 ha subplots. Topographically heterogeneous sites showed positive spatial autocorrelation in AGB at scales of 100 m and above; at smaller scales, most study sites showed negative or nonexistent spatial autocorrelation in AGB. We further show that when field calibration plots are smaller than the remote sensing pixels, the high local spatial variability in AGB leads to a substantial "dilution" bias in calibration parameters, a bias that cannot be removed with current statistical methods. Overall, our results suggest that topography should be explicitly accounted for in future sampling strategies and that much care must be taken in designing calibration schemes if remote sensing of forest carbon is to achieve its promise. (Résumé d'auteur)

<http://dx.doi.org/10.5194/bg-11-6827-2014> Cirad-Agritrop Dk : 574428

Articles publiés dans une revue à facteur d'impact

126

Aubry-Kientz, M., Hérault, B., Ayotte-Trépanier, C., Baraloto, C., and Rossi, V. (2013)

Toward trait-based mortality models for tropical forests

Toward trait-based mortality models for tropical forests

PLoS One vol.8:n°5

Tree mortality in tropical forests is a complex ecological process for which modelling approaches need to be improved to better understand, and then predict, the evolution of tree mortality in response to global change. The mortality model introduced here computes an individual probability of dying for each tree in a community. The mortality model uses the ontogenetic stage of the tree because youngest and oldest trees are more likely to die. Functional traits are integrated as proxies of the ecological strategies of the trees to permit generalization among all species in the community. Data used to parametrize the model were collected at Paracou study site, a tropical rain forest in French Guiana, where 20,408 trees have been censused for 18 years. A Bayesian framework was used to select useful covariates and to estimate the model parameters. This framework was developed to deal with sources of uncertainty, including the complexity of the mortality process itself and the field data, especially historical data for which taxonomic determinations were uncertain. Uncertainty about the

functional traits was also considered, to maximize the information they contain. Four functional traits were strong predictors of tree mortality: wood density, maximum height, laminar toughness and stem and branch orientation, which together distinguished the light-demanding, fast-growing trees from slow-growing trees with lower mortality rates. Our modelling approach formalizes a complex ecological problem and offers a relevant mathematical framework for tropical ecologists to process similar uncertain data at the community level. (Résumé d'auteur)

<http://dx.doi.org/10.1371/journal.pone.006367> Cirad-Agritrop Dk : 569423

Articles publiés dans une revue à facteur d'impact

127

Fortunel, C., Ruelle, J., Beauchêne, J., Fine, P. V. A., and Baraloto, C. (2014)

Wood specific gravity and anatomy of branches and roots in 113 Amazonian rainforest tree species across environmental gradients

Wood specific gravity and anatomy of branches and roots in 113 Amazonian rainforest tree species across environmental gradients

New phytologist vol.202:n°1

Wood specific gravity (WSG) is a strong predictor of tree performance across environmental gradients. Yet it remains unclear how anatomical elements linked to different wood functions contribute to variation in WSG in branches and roots across tropical forests. We examined WSG and wood anatomy in white sand, clay terra firme and seasonally flooded forests in French Guiana, spanning broad environmental gradients found throughout Amazonia. We measured 15 traits relating to branches and small woody roots in 113 species representing the 15 most abundant species in each habitat and representative species from seven monophyletic lineages occurring in all habitats. Fiber traits appear to be major determinants of WSG, independent of vessel traits, in branches and roots. Fiber traits and branch and root WSG increased from seasonally flooded species to clay terra firme species and lastly to white sand species. Branch and root wood traits were strongly phylogenetically constrained. Lineages differed in wood design, but exhibited similar variation in wood structure across habitats. We conclude that tropical trees can invest differently in support and transport to respond to environmental conditions. Wind disturbance and drought stress represent significant filters driving tree distribution of Amazonian forests; hence we suggest that biophysical explanations should receive more attention. (Résumé d'auteur)

<http://dx.doi.org/10.1111/nph.12632> Cirad-Agritrop Dk : 572668

Articles publiés dans une revue à facteur d'impact

128

Vogt, J., Piou, C., and Berger, U. (2014)

Comparing the influence of large- and small-scale disturbances on forest heterogeneity: A simulation study for mangroves

Comparing the influence of large- and small-scale disturbances on forest heterogeneity: A simulation study for mangroves

Ecological complexity vol.20

Disturbances play a crucial role in various forest ecosystems and represent major shaping forces in forest succession and spatio-temporal processes. In this study, we simulated different disturbance regimes using the individual-based mangrove forest model KiWi. Frequent small-scaled gaps caused by lightning strikes and rare medium-sized patches caused by hurricanes were produced with varying size, severity and frequency. Additionally, a mixed regime including both lightning strikes and hurricanes was simulated. All three scenarios produced the same tree mortality rate over the simulation periods. We analyzed the temporal and spatial variations in these disturbances, taking into account their homogenizing or heterogenizing effects on the forest structure of a simulated area of 25 ha. All disturbance regimes produced significantly more homogenizing effects on the spatial forest structure than an undisturbed scenario. The hurricane regime produced a temporal heterogenization of the forest structure, while the small-scaled frequent lightning strike gaps were not able to contribute to additional heterogeneity. This shows that the explicit implementation of the disturbances generates different forest structures. The simulation results were integrated into an existing conceptual model for mangrove forest dynamics. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.ecocom.2014.09.008> Cirad-Agritrop Dk : 574329

Articles publiés dans une revue à facteur d'impact

129

Bourbier, L., Cornu, G., Pennec, A., Brognoli, C., and Gond, V. (2013)

Large-scale estimation of forest canopy opening using remote sensing in Central Africa

Large-scale estimation of forest canopy opening using remote sensing in Central Africa
Bois et forêts des tropiques n°315 2011-11-15/2011-11-18

Les activités humaines en forêt humide tropicale sont à l'origine de perturbations et de dégradations du fait de leur mitage du couvert forestier. Des capacités permettant de mesurer l'étendue des dégâts sont indispensables au calcul des émissions de carbone dans le cadre des programmes Redd+ (Réduction des émissions dues à la déforestation et la dégradation des forêts). La télédétection est un outil puissant pour le recueil de ce type d'information (concernant, par exemple, l'exploitation forestière ou minière ou les projets d'infrastructure). Différentes techniques sont mises en œuvre pour identifier et quantifier l'ouverture du couvert forestier. Il s'agit ici de les compléter en comparant l'ouverture passée et actuelle du couvert forestier afin de documenter le renouvellement des écosystèmes suite aux opérations d'exploitation forestière. Cet article présente une approche mettant en œuvre une chaîne de traitement semi-automatisée adaptée à l'imagerie Landsat. En post-traitement, l'information portant sur l'ouverture de la canopée est extraite à l'aide d'algorithmes spécifiques. Un index spatial, calibré sur des données radiométriques à basse résolution, indique les taux d'ouverture passés et actuels. Ce procédé fournit des estimations de la dégradation forestière permettant de décrire les données de télédétection à basse résolution (issues de Modis, par exemple) utilisées pour la cartographie terrestre. Ces estimations sont alors croisées avec des cartes de couverture terrestre afin de distinguer des catégories forestières actuelles. Cet outil a été développé dans le cadre du projet CoForChange, dont l'objectif global est de prévoir l'évolution du couvert forestier et de la distribution des essences dans le Bassin du Congo liée aux changements globaux, et de développer des outils d'aide à la décision. Cet article présente un exemple en grandeur et en temps réels, situé dans la forêt humide aux frontières de la République centrafricaine, de la République du Congo et du Cameroun, analysé année par année à l'aide de trente années d'archives Landsat. (Résumé d'auteur)

Cirad-Agritrop : CD_PE710; BA_PEBA872; RN_PERN113 Dk : 569765

Articles publiés dans une revue à facteur d'impact

130

Betbeder, J., Gond, V., Frappart, F., Baghdadi, N., Briant, G., and Bartholomé, E. (2014)

Mapping of Central Africa forested wetlands using remote sensing

Mapping of Central Africa forested wetlands using remote sensing

IEEE Journal of selected topics in applied earth observations and remote sensing vol.7:n°2

Wetlands represent 6% of the Earth's land cover surface. They are of crucial importance in the global water cycle and climatic dynamics. Nowadays, wetlands are the most threatened land cover type, nevertheless their spatial distribution and ecological functions are poorly documented. Despite the need for more detailed information, wetland mapping is a rare activity. Few data are available mainly because of the complexity of obtaining good field data. We therefore propose a method based on multisensor imagery analysis to characterize land cover patterns of the second largest wetland area of the world (The Cuvette Centrale of the Congo River Basin). The time series of moderate resolution imaging spectroradiometer (MODIS) enhanced vegetation index (EVI) images are used to map land cover types based on their phenological differences. Flooded areas in the Congo basin have been mapped during different seasons using L-band synthetic aperture radar (PALSAR) imagery. The associated model has been improved upon by the addition of elevation data as well as mean canopy heights acquired with light detection and ranging (LIDAR) data. The result of this study is the first detailed spatial distribution of four forested wetland types within the Cuvette Centrale of the Congo River Basin. This study demonstrates that the spatial organization of the floodplain landscape depends on the extent of flooding. The results also show that land cover phenology is closely related to the time period of flooding and solar intensity for this region, similarly to what is observed in the extensive floodplain of the Amazon basin. (Résumé d'auteur)

<http://dx.doi.org/10.1109/JSTARS.2013.2269733> Cirad-Agritrop Dk : 572643

Articles publiés dans une revue à facteur d'impact

8.3.3. Plantations : palmier, eucalyptus, hévéa, et autres publications relatives à une seule espèce d'arbre

131

Bessou, C., Chase, L. D. C., Henson, I. E., Abdul-Manan, A. F. N., Mila i Canals, L., Agus, F., Sharma, M., and Chin, M. (2014)

Pilot application of PalmGHG, the Roundtable on Sustainable Palm Oil greenhouse gas calculator for oil palm products

Pilot application of PalmGHG, the Roundtable on Sustainable Palm Oil greenhouse gas calculator for oil palm products

Journal of cleaner production vol.73

The Roundtable on Sustainable Palm Oil (RSPO) is a non-profit association promoting sustainable palm oil through a voluntary certification scheme. Two successive science-based working groups on greenhouse gas (GHG) were active in RSPO from 2009 to 2011, with the aim of identifying ways of achieving meaningful and verifiable reductions of GHG emissions. One of the outputs of the second group is PalmGHG, a GHG calculator using the life cycle assessment approach to quantify major sources of emissions and sequestration for individual palm oil mills and their supply base. A pilot study was carried out in 2011 with nine RSPO member companies that gave an average of 1.67 t CO₂e/t crude palm oil (CPO), with a range of -0.02 to +8.32 t CO₂e/t CPO. Previous land use and the area of peat soil used were the main causes of the variation. Further modifications to PalmGHG continue to be made in order to make the tool more flexible and comprehensive, to refine default values, and to render it more user-friendly. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.jclepro.2013.12.008> Cirad-Agritrop Dk : 573482

Articles publiés dans une revue à facteur d'impact

132

Savilaakso, S., Garcia, C. A., Garcia-Ulloa, J., Ghazoul, J., Groom, M., Guariguata, M., Laumonier, Y., Nasi, R., Petrokofsky, G., Snaddon, J., and Zrust, M. (2014)

Systematic review of effects on biodiversity from oil palm production

Systematic review of effects on biodiversity from oil palm production

Environmental Evidence vol.3:n°4

Background: During the past decade there has been a growing interest in bioenergy, driven by concerns about global climate change, growing energy demand, and depleting fossil fuel reserves. The predicted rise in biofuel demand makes it important to understand the potential consequences of expanding biofuel cultivation. A systematic review was conducted on the biodiversity impacts of three first-generation biofuel crops (oil palm, soybean, and jatropha) in the tropics. The study focused on the impacts on species richness, abundance (total number of individuals or occurrences), community composition, and ecosystem functions related to species richness and community composition. **Methods:** Literature was searched using an a priori protocol. Owing to a lack of available studies of biodiversity impacts from soybean and jatropha that met the inclusion criteria set out in the systematic review protocol, all analyses focused on oil palm. The impacts of oil palm cultivation on species richness, abundance, and community similarity were summarized quantitatively; other results were summarized narratively. **Results:** The searches returned 9143 articles after duplicate removal of which 25 met the published inclusion criteria and were therefore accepted for the final review. Twenty of them had been conducted in Malaysia and two thirds were on arthropods. Overall, oil palm plantations had reduced species richness compared with primary and secondary forests, and the composition of species assemblages changed significantly after forest conversion to oil palm plantation. Abundance showed species-specific responses and hence, the overall abundance was not significantly different between plantations and forest areas. Only one study reported how different production systems (smallholdings vs. industrial estates) affect biodiversity. No studies that examined the effects on ecosystem functions of reduced species richness or changes in community composition met the inclusion criteria. Neither were there studies that reported how areas managed under different standards (e.g. different certification systems) affect biodiversity and ecosystem function. **Conclusions:** Our review suggests that oil palm plantations have reduced species richness compared with primary and secondary forests, and the composition of species assemblage changes significantly after forest conversion to oil palm plantation. Effects of different production systems on biodiversity and ecosystem function are clear knowledge gaps that should be addressed in future research. (Résumé d'auteur)

<http://dx.doi.org/10.1186/2047-2382-3-4> Cirad-Agritrop Dk : 573191

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

133

Dubos, B., and Flori, A. (2014)

Persistence of mineral fertility carried over from the first crop cycle in two oil palm plantations in South America

Persistence of mineral fertility carried over from the first crop cycle in two oil palm plantations in South America

Oil Palm Bulletin n°68

In South America, factorial fertilisation trials were set up on oil palm estates managed by Palmeras de los Andes in Ecuador and Indupalma S.A. in Colombia to control fertilisation during the two oil palm crop cycles. These experiments were designed to determine the optimal leaf contents of N, P, K, Mg and Cl, in recent planting materials and to assess the impacts of the first crop cycle on the following cycle. In the two presented trials, nitrogen and chlorine treatments were found to have the greatest impact on production after 10 years of monitoring. The observed leaf N and Cl deficiencies resulted in a significant effect on the average bunch weight, but these differences did not lead to significant differences in yield. However, after 10 years of monitoring, it was found that the yield differences between the highest and the lowest nitrogen rates (N₂-N₀) and between the highest and the lowest chlorine rates (Cl₂-Cl₀), increased steadily until reaching a threshold at which some authors consider that supplementary fertilisation is required. In both experiments, soil mineral reserves had not been tapped during the first oil palm crop cycle, which had benefitted from mean rational fertiliser rates of 3 - 5 kg palm⁻¹ yr⁻¹. These reserves were sufficient to limit a yield decline in the non-fertilised treatments. We also noted that it took a long time for the differences in leaf mineral content and yields to become significant, thus confirming that these are long-term effects. Hence, in a suitably fertilised plantation, it is very unlikely that the effects of fertiliser applications during previous years could be reflected by inter-annual yield variations. However, there is no reason to consider that the depressive effect of poor climatic conditions, such as prolonged drought, could be overcome by increasing early fertilisation. (Résumé d'auteur)

<http://palmoilis.mpob.gov.my/index.php/opb> Cirad-Agritrop Dk : 574799

Autres articles

134

Aholoukpé, H., Dubos, B., Flori, A., Deleporte, P., Amadji, G. L., Chotte, J.-L., and Blavet, D. (2013) **Estimating aboveground biomass of oil palm: Allometric equations for estimating frond biomass**

Estimating aboveground biomass of oil palm: Allometric equations for estimating frond biomass
Forest ecology and management vol.292

Allometric equations were developed to estimate the biomass of oil palm frond with nontree-lethal methods. The study was conducted in oil palm plantations belonging to the Oil Palm Research Center of the Institut National de Recherches Agricoles du Bénin (INRAB) and to neighboring smallholders oil palm plantations. Complete measurements of individual fronds biomass and measurements of predictor variables were made by two methods: (1) a tree-lethal (destructive) method and (2) a nontree-lethal method. Measurements were done on 25 palm trees of several ages and from different genetic origins. Frond variables measured were: length (L) and dry weight (DW) of the petiole and rachis, dry weight of leaflets, dry weight of a fragment (length = 0.30 m) taken from mid way along the rachis, thickness and width of the petiole cross section (junction of petiole and rachis). Linear regressions were established with biomass data obtained for different parts of the palm frond by the two methods. The results showed that up to rank 9, frond biomass increased with frond position in the crown. From rank 10, fronds were mature and their biomass showed a nearly constant value independently of rank. These results led to the establishment of a simple equation to estimate frond biomass based on rachis dry weight: DW_{frond} = 1.147 + 2.135 _ DW_{rachis} ($R^2 = 0.62$). This relationship is closer than Corley's one based on the cross section of the petiole ($R^2 = 0.22$). Rachis dry weight can easily be estimated ($R^2 = 0.94$) using rachis length and linear density (or mass per length) of a fragment of 0.30 m taken from mid way along the rachis. The equation is: DW_{rachis} 1/4 1:133_L_rachisDWfragment=0:30. The study also showed that one of the applications of our allometric equations is the determination of the average dry weight of mature fronds from at least three mature fronds (rank > 10). This could allow an estimate of the annual production of oil palm fronds biomass, and then the estimate of fronds carbon stock. The latter could contribute to the assessment of environmental impact of forest conversion into oil palm plantations. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.foreco.2012.11.027> Cirad-Agritrop Dk : 567302

Articles publiés dans une revue à facteur d'impact

135

Macombe, C., Leskinen, P., Feschet, P., and Antikainen, R. (2013)

Social life cycle assessment of biodiesel production at three levels: A literature review and development needs

Social life cycle assessment of biodiesel production at three levels: A literature review and development needs

Journal of cleaner production vol.52

Assessment of social impacts of products and services has gained increasing interest in society. Life cycle assessment (LCA) is a tool developed to estimate the impacts of products and services from cradle to grave. Traditionally LCA has focused on environmental impacts, but recently approaches for social life cycle assessment (SLCA) have also been developed. Most of them fairly address social performances of business, but the aim of this paper is to analyse the possibilities and development needs in the complementary approach, which is the evaluation of social impacts in LCA. We review the field in general and take a closer look at the empirical case of biodiesel production, which is a timely topic globally in view of the climate change mitigation objectives. The analysis is carried out at three levels e company, regional, and state level. Despite active development in the field of SLCA, we conclude that in many cases it is not yet possible to carry out a comprehensive SLCA. Finally, we outline lines of research that would further improve the methodological and empirical basis of SLCA at various levels of decision-making. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.jclepro.2013.03.026> Cirad-Agritrop Dk : 569265

Articles publiés dans une revue à facteur d'impact

136

Ramananantoandro, T., Razafimahatrata, R. A., Verhaegen, D., and Chaix, G. (2014)

Genetic diversity of introduced species facing climate change: #Eucalyptus robusta# in eastern Madagascar

Genetic diversity of introduced species facing climate change: #Eucalyptus robusta# in eastern Madagascar

International forestry review vol.16:n°5 2014-10-05/2014-10-11

Eucalyptus is the most widely planted species in Madagascar. Eucalyptus robusta is the most common species (225 000 ha) because it is well adapted and has multipurpose wood uses (energy, pole, and timber). Although this species has been naturalized for more than a century, little is known about the introduced genetic diversity. Previous research leads us to assume that it has a narrow genetic base. A study of genetic variability and genotype by environment interaction for E. robusta growth was therefore conducted. This study concerns two provenance trials (24 provenances from Australia, 1 from Madagascar) and three progeny trials established in two bioclimatic regions, regularly monitored for >10 years. In both sites, results showed strong provenance effects and genotype by environment interactions for growth. However, the Malagasy provenance was the poorer performer for growth, compared to the Australian. This could be attributed to its origin, mainly to inbreeding depressions due to the narrow genetic base introduced. Due to climate change, this low diversity, which will be confirmed by ongoing molecular genetic studies, may represent biological and economical risks. These will help forest managers to capitalize on the genetic resources existing in Madagascar for a better future. (Texte intégral)

Cirad-Agritrop Dk : 574452

Articles publiés dans une revue à facteur d'impact

137

Battie Laclau, P., Laclau, J.-P., Domec, J.-C., Christina, M., Bouillet, J.-P., De Cassia Piccolo, M., De Moraes Gonçalves, J. L., Moreira e Moreira, R., Krusche, A. V., Bouvet, J.-M., and Nouvellon, Y. (2014)

Effects of potassium and sodium supply on drought-adaptive mechanisms in #Eucalyptus# grandis plantations

Effects of potassium and sodium supply on drought-adaptive mechanisms in #Eucalyptus# grandis plantations

New phytologist vol.203:n°2

A basic understanding of nutrition effects on the mechanisms involved in tree response to drought is essential under a future drier climate. A large-scale throughfall exclusion experiment was set up in Brazil to gain an insight into the effects of potassium (K) and sodium (Na) nutrition on tree structural and physiological adjustments to water deficit. Regardless of the water supply, K and Na supply greatly increased growth and leaf area index (LAI) of Eucalyptus grandis trees over the first 3 yr after planting. Excluding 37% of throughfall reduced above-ground biomass accumulation in the third year after planting for K-supplied trees only. E. grandis trees were scarcely sensitive to drought as a result of the utilization of water stored in deep soil layers after clear-cutting the previous plantation. Trees

coped with water restriction through stomatal closure (isohydrodynamic behavior), osmotic adjustment and decrease in LAI. Additionally, droughted trees showed higher phloem sap sugar concentrations. K and Na supply increased maximum stomatal conductance, and the high water requirements of fertilized trees increased water stress during dry periods. Fertilization regimes should be revisited in a future drier climate in order to find the right balance between improving tree growth and limiting water shortage. (Résumé d'auteur)

<http://dx.doi.org/10.1111/nph.12810> Cirad-Agritrop Dk : 573553

Articles publiés dans une revue à facteur d'impact

138

Franco, M. P., Laclau, J.-P., Sette Junior, C. R., Tomazello Filho, M., and Chaix, G. (2014)

Impact of alternative fertilization with sodium on growth and wood quality of Eucalyptus grandis plantations in Brazil

Impact of alternative fertilization with sodium on growth and wood quality of Eucalyptus grandis plantations in Brazil

International forestry review vol.16:n°5 2014-10-05/2014-10-11

Climate changes result in hydrological cycle alterations, with impacts on distribution and quantity of rainfall affecting forest plantations in the tropics and subtropics. Trees minimize water stress effects by leaf osmotic adjustments which are dependent on K ions. Eucalyptus plantations were established in tropical and subtropical soils especially poor in K. Fertilization by substitution of K by Na is a potential alternative way, at lower cost and greater availability, that is especially suitable for smallholder plantations. For these reasons, we studied respective K and Na fertilization effects on growth and basic wood density of Eucalyptus grandis plantations with different objectives (domestic energy, timber). Significant differences in volume of trunk and wood density were observed on 8-year-old E. grandis trees fertilized with Na vs. K and the control. Trees with Na fertilization showed a significantly higher volume with Na vs. the control and a lower volume vs. K. Wood density and radial variability were significantly lower compared to trees with K and the control. In this paper we discuss the advantages of Na fertilization both to minimize the drought stress effect due to global climate change and to optimize economically the wood production of smallholder plantations. (Texte intégral)

Cirad-Agritrop Dk : 574450

Articles publiés dans une revue à facteur d'impact

139

Bartholome, J. (2014)

Déterminisme génétique de la dynamique de croissance et de la composition isotopique du carbone chez l'Eucalyptus en réponse aux variations environnementales. Thèse, Montpellier SupAgro, CIRAD-BIOS-UMR AGAP. 296 p.

Les différents scénarios sur l'évolution du climat prévoient une augmentation de la fréquence et de l'intensité des sécheresses. La croissance des arbres forestiers étant fortement conditionnée par la disponibilité en eau, ces changements devraient impacter de manière significative la productivité des forêts plantées. La compréhension de l'impact des facteurs génétiques et environnementaux sur la dynamique de croissance est donc un enjeu majeur pour assurer les niveaux de production des plantations de demain. L'Eucalyptus, grâce à sa croissance rapide et à la disponibilité de ressources génétiques et génomiques, est un modèle biologique idéal pour mener ces recherches. L'objectif de cette thèse est de caractériser l'architecture génétique de la dynamique de croissance à différentes échelles de temps chez l'eucalyptus en relation avec : (i) les variations environnementales, et notamment l'évolution de la disponibilité en eau, et (ii) la composition isotopique du carbone de l'arbre ($\delta^{13}\text{C}$), un caractère lié à l'efficience d'utilisation de l'eau. Pour répondre à cet objectif, un croisement interspécifique Eucalyptus urophylla x E. grandis a été étudié dans quatre dispositifs expérimentaux en République du Congo. Notre approche se base sur la cartographie des loci à effet quantitatif (QTL) et combine : (i) un génotypage haut débit, (ii) une caractérisation inter et intra-annuelle de la croissance et du $\delta^{13}\text{C}$, ainsi qu'un suivi en continu des micro-variations du rayon et (iii) une caractérisation en continu des facteurs environnementaux. Ces travaux ont tout d'abord conduit à la construction des premières cartes génétiques à haute résolution chez l'Eucalyptus. L'analyse de l'architecture génétique du $\delta^{13}\text{C}$ a ensuite permis de mettre en évidence des gènes candidats positionnels, potentiellement impliqués dans la variation de ce caractère. Enfin, la caractérisation inter et intra-annuelle de la dynamique de croissance a permis de montrer que l'architecture génétique de la croissance, au stade adulte, est structurée par les réponses à l'environnement au stade juvénile. Ces réponses ont ensuite été analysées grâce aux profils de micro-variations du rayon, permettant

ainsi de préciser leurs déterminants génétiques Nos résultats soulignent l'importance de considérer la croissance comme un caractère dynamique, non seulement pour la compréhension de ses bases génétiques, mais également à des fins de sélection de variétés adaptées à un environnement changeant. (Résumé d'auteur)

Cirad-Agritrop Dk : 573607

140

Marsden, C., Nouvellon, Y., Laclau, J.-P., Corbeels, M., McMurtrie, R. E., Stape, J. L., Epron, D., and Le Maire, G. (2013)

Modifying the G'DAY process-basedmodel to simulate the spatial variability of #Eucalyptus# plantation growth on deep tropical soils

Modifying the G'DAY process-basedmodel to simulate the spatial variability of #Eucalyptus# plantation growth on deep tropical soils

Forest ecology and management vol.301

Large differences in productivity have been observed between neighboring Eucalyptus plantations in Brazil, that cannot be explained by climate and are unlikely to be due solely to altered management practices. Current ecophysiological models used by forestry companies to simulate stand development in large plantation zones rely on empirical site fertility indices (representing water and nutrient availability) to capture this spatial variability in growth rates. We propose a model that requires no empirical assessment of site fertility to simulate stand growth over entire rotations. We applied a modified version of the G'DAY model of carbon, nitrogen and water cycling at a daily time step to short-rotation plantations located in São Paulo State, including a simple mechanistic description of the effect of water availability on growth. The progressive and rapid root exploration of deep soil layers was modeled in a simple way, by considering that maximum plant available water increased with mean tree height. The model was parameterized using detailed measurements made over the entire rotation of an experimental stand of *Eucalyptus grandis*, and was subsequently applied to 16 clonal stands managed in a similar way by one company, but with different planting dates and contrasting productivity levels. Stem biomass simulations, driven by daily weather data (maximum and minimum air temperatures, global radiation and rainfall), were strongly correlated with company inventory estimates of stem biomass carried out at different ages. The temporal variation of leaf area index was also adequately simulated, as was shown by comparison with leaf area index derived from satellite data. The model was able to capture more than 95% of the variability of standing stem biomass and more than 85% of the variability of stem growth measured on these stands, provided spatial differences in soil water holding capacity were taken into account. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.foreco.2012.10.039> Cirad-Agritrop Dk : 569089

Articles publiés dans une revue à facteur d'impact

141

Sainte-Marie, J., Saint-André, L., Nouvellon, Y., Laclau, J.-P., Roupsard, O., Le Maire, G., Delpierre, N., Henrot, A., and Barrandon, M. (2014)

A new probabilistic canopy dynamics model (SLCD) that is suitable for evergreen and deciduous forest ecosystems

A new probabilistic canopy dynamics model (SLCD) that is suitable for evergreen and deciduous forest ecosystems

Ecological modelling vol.290

There are strong uncertainties regarding LAI dynamics in forest ecosystems in response to climate change. While empirical growth & yield models (G&YMs) provide good estimations of tree growth at the standlevel on a yearly to decennial scale, process-based models (PBMs) use LAI dynamics as a key variable forenabling the accurate prediction of tree growth over short time scales. Bridging the gap between PBMsand G&YMs could improve the prediction of forest growth and, therefore, carbon, water and nutrientfluxes by combining modeling approaches at the stand level. Our study aimed to estimate monthly changes of leaf area in response to climate variations fromsparse measurements of foliage area and biomass. A leaf population probabilistic model (SLCD) wasdesigned to simulate foliage renewal. The leaf population was distributed in monthly cohorts, and thetotal population size was limited depending on forest age and productivity. Foliage dynamics were drivenby a foliation function and the probabilities ruling leaf aging or fall. Their formulation depends on theforest environment. The model was applied to three tree species growing under contrasting climates and soil types. In tropical Brazilian evergreen broadleaf eucalypt plantations, the phenology was described using 8 parameters. A multi-objective evolutionary algorithm method (MOEA) was used to fit the model parameterson litterfall and LAI data over an entire stand rotation. Field measurements from a second eucalypt

standwere used to validate the model. Seasonal LAI changes were accurately rendered for both sites ($R^2= 0.898$ adjustment, $R^2= 0.698$ validation). Litterfall production was correctly simulated ($R^2= 0.562$, $R^2= 0.4018$ validation) and may be improved by using additional validation data in future work. In two French temperate deciduous forests (beech and oak), we adapted phenological sub-modules of the CASTANEA modelto simulate canopy dynamics, and SLCD was validated using LAI measurements. The phenological patterns were simulated with good accuracy in the two cases studied. However, LAImaxwas not accuratelysimulated in the beech forest, and further improvement is required.Our probabilistic approach is expected to contribute to improving predictions of LAI dynamics. Themodel formalism is general and suitable to broadleaf forests for a large range of ecological conditions.(c) 2014 Elsevier B.V. All rights reserved. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.ecolmodel.2014.01.026> Cirad-Agritrop Dk : 574138

Articles publiés dans une revue à facteur d'impact

142

Epron, D., Nouvellon, Y., Mareschal, L., Moreira e Moreira, R., Koutika, L.-S., Geneste, B., Delgado Rojas, J. S., Laclau, J.-P., Sola, G., De Moraes Gonçalves, J. L., and Bouillet, J.-P. (2013)

Partitioning of net primary production in #Eucalyptus# and Acacia stands and in mixed-species plantations: Two case-studies in contrasting tropical environments

Partitioning of net primary production in #Eucalyptus# and Acacia stands and in mixed-species plantations: Two case-studies in contrasting tropical environments

Forest ecology and management vol.301

The introduction of nitrogen fixing species (NFS) in fast-growing tree plantations is an alternative option to reduce fertilizer inputs. However, the success of mixed-species plantations depends on the balance between positive interactions among species (resulting from facilitation and/or complementarity) and the negative effects of interspecific competition. Using a carbon budget approach and coupling measurements of standing biomass, aboveground litterfall and soil CO₂ efflux, we assessed the influence of replacing half of eucalypt trees by Acacia mangium on total belowground carbon flux (TBCF), net primary production (NPP) and its partitioning between above- and belowground growth at two tropical sites in Brazil (Itatinga) and in Congo (Kissoko) exhibiting contrasting climates, edaphic conditions and wood productions. Annual soil CO₂ efflux (FS) was significantly lower in the acacia monocultures than in eucalypt monocultures and mixed-species stands at both sites. Annual FS was significantly lower at Itatinga compared to Kissoko for all stands while TBCF was significantly lower in the eucalypt stands only. In the eucalypt monocultures we found a significantly lower aboveground NPP (ANPP) and wood production (wood NPP) at Kissoko compared to Itatinga that was almost fully balanced by a significantly higher belowground NPP (BNPP), leading to similar NPP. Similarly, acacia monocultures exhibited significantly higher ANPP and wood NPP at Itatinga than at Kissoko. The mixed-species stands exhibited a significantly lower wood NPP and ANPP than the eucalypt monocultures at the Brazilian site while NPP of the mixture was not significantly different than the average NPP of the two monocultures. At the Congolese site, NPP of the mixture was significantly higher than the average NPP of the two monocultures. NPP was similar in the mixed-species stand and the eucalypt monoculture with a significantly lower partitioning of NPP to belowground production, leading to a one third higher wood biomass at harvest in the mixed-species stand. A positive effect of growing eucalypts with the nitrogen fixing acacia trees on stand wood production occurred at Kissoko but not at Itatinga. Mixed-species plantations with NFS can be advocated at sites where the productive gains resulting from nitrogen fixation are not compromised by other resource limitations. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.foreco.2012.10.034> Cirad-Agritrop Dk : 569092

Articles publiés dans une revue à facteur d'impact

143

Verhaegen, D., Randrianjafy, H., Rakotondraoelina, H., Trendelenburg Rakotonirina, M.-C., Andriamampianina, N., Montagne, P., Rasamindisa, A., Chaix, G., Bouillet, J.-P., and Bouvet, J.-M. (2014)

#Eucalyptus robusta# pour une production durable de bois énergie à Madagascar : bilan des connaissances et perspectives

#Eucalyptus robusta# pour une production durable de bois énergie à Madagascar : bilan des connaissances et perspectives

Bois et forêts des tropiques n°320, spec.

Cirad-Agritrop : CD_PE710; BA_PEBA872; RN_PERN113 Dk : 574429

Articles publiés dans une revue à facteur d'impact

144

González-García, S., Dias, A. C., Clermidy, S., Benoist, A., Bellon-Maurel, V., Gasol, C., Gabarrell, X., and Arroja, L. (2014)

Comparative environmental and energy profiles of potential bioenergy production chains in Southern Europe

Comparative environmental and energy profiles of potential bioenergy production chains in Southern Europe

Journal of cleaner production vol.76

In this study, life cycle assessment (LCA) is used to assess and compare the environmental and energy profiles of three potential bioenergy production chains using different available feedstocks in Southern European countries. Two wastes, vineyard pruning and eucalypt logging residues, and a wooden energy crop, poplar, were examined in detail. The comparative LCA study showed that the use of poplar biomass for bioenergy production has a greater impact than the use of vineyard pruning and logging residues. The contribution from the poplar cultivation-related activities considerably affected the results, as all the activities from field preparation to harvesting have been included within the system boundaries. In contrast, all the activities performed in the vineyard and forest prior to collection of the residues have not been computed in both scenarios since they have been allocated to the driving force of these stands: grapes and roundwood, respectively. The results support the idea that forest and agricultural waste would be an interesting and potential raw material for bioenergy purposes. However, further analysis should focus on these potential bioenergy sources, namely in terms of their availability and technical burning conditions, in order to meet energy requirements. Moreover, the environmental results were compared with others from literature corresponding to electricity production using alternative biomass sources and fossil fuels. In all the categories considered for comparison, environmental benefits were reported for the electricity production using a biomass source. However, these results must be carefully used since other issues such as production costs, water availability and land use should be considered. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.jclepro.2014.04.022> Cirad-Agritrop Dk : 573438

Articles publiés dans une revue à facteur d'impact

145

Derrien, D., Plain, C., Courty, P.-E., Gelhaye, L., Moerdijk-Poortvliet, T. C. W., Thomas, F., Versini, A., Zeller, B., Koutika, L.-S., Boschker, H. T. S., and Epron, D. (2014)

Does the addition of labile substrate destabilise old soil organic matter?

Does the addition of labile substrate destabilise old soil organic matter?

Soil Biology and Biochemistry vol.76

Input of organic matter to soil may stimulate microbial activity and alter soil carbon storage by modifying the mineralization of native soil organic carbon (SOC). Assessing the age of SOC affected by the altered mineralization is a major challenge as the destabilisation of old SOC would be much more damageable for the overall carbon budget than the mobilization of recent SOC. Here, we investigated the microbial populations sequentially activated after the addition of a labile substrate. We questioned whether they have distinct metabolic potential and we characterised the age of the native SOC they primed. We used soils from Congolese Eucalyptus plantations that were previously under savannah and which old and recent SOC exhibited different $\delta^{13}\text{C}$. Soils were amended with glucose, in an amount sufficient to induce microbe growth, and incubated for one week. The $\delta^{13}\text{C}$ of respiration CO₂ was continuously recorded using a tunable diode laser spectrometer (TDLS). The combination of two glucose treatments with different $\delta^{13}\text{C}$ signatures allowed partitioning the various sources of CO₂ over time (recent SOC, old SOC and glucose). This was combined with phospholipid fatty acids (PLFA) analyses and potential metabolic activities measurements after 40 h and seven days of incubation. A peak of glucose mineralization occurred after 17 h of incubation. Before this peak (Stage 1), some specific communities with a strong feeding preference for recent SOC were activated. After the glucose peak (Stage 2), over-mineralization of native SOC occurred for some days. The recent C3 SOC was first preferentially used (Stage 3), while the old C4 SOC was destabilised in a later stage (Stage 4). Metabolic functions and composition of microbial communities also differed between Stages 3 and 4. Microbial populations collected at Stage 4 were slower compared to Stage 3, but more efficient in decomposing nutrient-containing substrates. Gram negative bacteria (16:1w7c and 18:1w7c) were stimulated at Stage 3 only, while Gram negative bacteria (cyt17:0) were stimulated at both Stages 3 and 4. Our results demonstrated that the input of labile substrate alters the microbial community composition, potential metabolic activities, and the SOC pools utilisation. They pointed out

the necessity to assess the age of destabilised SOC when investigating the impact of priming on carbon storage in soil. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.soilbio.2014.04.030> Cirad-Agritrop Dk : 573764

Articles publiés dans une revue à facteur d'impact

146

Satakhum, D., Gay, F., Chairungsee, N., Kasemsap, P., Chantuma, P., Thanisawanyangkura, S., Thaler, P., and Epron, D. (2013)

Soil CO₂ efflux and soil carbon balance of a tropical rubber plantation

Soil CO₂ efflux and soil carbon balance of a tropical rubber plantation

Ecological Research vol.28:n°6

Natural rubber is a valuable source of income in many tropical countries and rubber trees are increasingly planted in tropical areas, where they contribute to land-use changes that impact the global carbon cycle. However, little is known about the carbon balance of these plantations. We studied the soil carbon balance of a 15-year-old rubber plantation in Thailand and we specifically explored the seasonal dynamic of soil CO₂ efflux (F_S) in relation to seasonal changes in soil water content (W_S) and soil temperature (T_S), assessed the partitioning of F_S between autotrophic (R_A) and heterotrophic (R_H) sources in a root trenching experiment and estimated the contribution of aboveground and belowground carbon inputs to the soil carbon budget. A multiplicative model combining both T_S and W_S explained 58 % of the seasonal variation of F_S. Annual soil CO₂ efflux averaged 1.88 kg C m⁻² year⁻¹ between May 2009 and April 2011 and R_A and R_H accounted for respectively 63 and 37 % of F_S, after corrections of F_S measured on trenched plots for root decomposition and for difference in soil water content. The 4-year average annual aboveground litterfall was 0.53 kg C m⁻² year⁻¹ while a conservative estimate of belowground carbon input into the soil was much lower (0.17 kg C m⁻² year⁻¹). Our results highlighted that belowground processes (root and rhizomicrobial respiration and the heterotrophic respiration related to belowground carbon input into the soil) have a larger contribution to soil CO₂ efflux (72 %) than aboveground litter decomposition. (Résumé d'auteur)

<http://dx.doi.org/10.1007/s11284-013-1079-0> Cirad-Agritrop Dk : 571633

Articles publiés dans une revue à facteur d'impact

147

Souza, L. M., Gazaffi, R., Mantello, C. C., Silva, C. C., Garcia, D., Le Guen, V., Cardoso, S. E. A., Garcia, A. A. F., and Souza, A. P. (2013)

QTL mapping of growth-related traits in a full-sib family of rubber tree (#Hevea brasiliensis#) evaluated in a sub-tropical climate

QTL mapping of growth-related traits in a full-sib family of rubber tree (#Hevea brasiliensis#) evaluated in a sub-tropical climate

PLoS One vol.8:n°4

The rubber tree (Hevea spp.), cultivated in equatorial and tropical countries, is the primary plant used in natural rubber production. Due to genetic and physiological constraints, inbred lines of this species are not available. Therefore, alternative approaches are required for the characterization of this species, such as the genetic mapping of full-sib crosses derived from outbred parents. In the present study, an integrated genetic map was obtained for a full-sib cross family with simple sequence repeats (SSRs) and expressed sequence tag (EST-SSR) markers, which can display different segregation patterns. To study the genetic architecture of the traits related to growth in two different conditions (winter and summer), quantitative trait loci (QTL) mapping was also performed using the integrated map. Traits evaluated were height and girth growth, and the statistical model was based in an extension of composite interval mapping. The obtained molecular genetic map has 284 markers distributed among 23 linkage groups with a total length of 2688.8 cm. A total of 18 QTLs for growth traits during the summer and winter seasons were detected. A comparison between the different seasons was also conducted. For height, QTLs detected during the summer season were different from the ones detected during winter season. This type of difference was also observed for girth. Integrated maps are important for genetics studies in outbred species because they represent more accurately the polymorphisms observed in the genitors. QTL mapping revealed several interesting findings, such as a dominance effect and unique segregation patterns that each QTL could exhibit, which were independent of the flanking markers. The QTLs identified in this study, especially those related to phenotypic variation associated with winter could help studies of marker-assisted selection that are particularly important when the objective of a breeding program is to obtain phenotypes that are adapted to sub-optimal regions. (Résumé d'auteur)

<http://dx.doi.org/10.1371/journal.pone.0061238> Cirad-Agritrop Dk : 568725
Articles publiés dans une revue à facteur d'impact

148

Chairungsee, N., Gay, F., Thaler, P., Kasemsap, P., Thanisawanyangkura, S., Chantuma, A., and Jourdan, C. (2013)

Impact of tapping and soil water status on fine root dynamics in a rubber tree plantation in Thailand

Impact of tapping and soil water status on fine root dynamics in a rubber tree plantation in Thailand
Frontiers in Plant Science vol.4:n°538

Fine roots (FR) play a major role in the water and nutrient uptake of plants and contribute significantly to the carbon and nutrient cycles of ecosystems through their annual production and turnover. FR growth dynamics were studied to understand the endogenous and exogenous factors driving these processes in a 14-year-old plantation of rubber trees located in eastern Thailand. FR dynamics were observed using field rhizotrons from October 2007 to October 2009. This period covered two complete dry seasons (November to March) and two complete rainy seasons (April to October), allowing us to study the effect of rainfall seasonality on FR dynamics. Rainfall and its distribution during the two successive years showed strong differences with 1500 and 950 mm in 2008 and 2009, respectively. FR production (FRP) completely stopped during the dry seasons and resumed quickly after the first rains. During the rainy seasons, FRP and the daily root elongation rate (RER) were highly variable and exhibited strong annual variations with a total FRP of 139.8 and 40.4 mm² and an average RER of 0.16 and 0.12 cm day⁻¹ in 2008 and 2009, respectively. The significant positive correlations found between FRP, RER, the appearance of new roots, and rainfall at monthly intervals revealed the impact of rainfall seasonality on FR dynamics. However, the rainfall patterns failed to explain the weekly variations of FR dynamics observed particularly during the rainy seasons. At this time step, FRP, RER, and the appearance of new FR were negatively correlated to the average soil matric potential measured at a depth of between 30 and 60 cm. In addition, our study revealed a significant negative correlation between FR dynamics and the monthly production of dry rubber. Consequently, latex harvesting might disturb carbon dynamics in the whole tree, far beyond the trunk where the tapping was performed. These results exhibit the impact of climatic conditions and tapping system in the carbon budget of rubber plantations. (Résumé d'auteur)

<http://dx.doi.org/10.3389/fpls.2013.00538> Cirad-Agritrop Dk : 572411

Articles publiés dans une revue à facteur d'impact

149

Abib, C. F., Ntoupka, M., Peltier, R., Harmand, J.-M., and Thaler, P. (2013)

Ethepron: A tool to boost gum arabic production from #Acacia senegal# and to enhance gummosis processes

Ethepron: A tool to boost gum arabic production from #Acacia senegal# and to enhance gummosis processes

Agroforestry Systems vol.87:n°2

Gum arabic production from Acacia senegal is lower in sub-humid areas than arid areas. Water stress is thought to be the reason for higher yields in arid areas. The application of ethephon is thought to mimic the effect of water stress in other plants. The objective of this study was to determine if the application of ethephon would increase the gum yields of Acacia senegal under sub-humid conditions in Cameroon. Trees receiving 40 or 120 mg ethephon were compared to controls in field experiments at a semi-arid and a sub-humid location in Northern Cameroon, over two seasons. Two provenances from drier areas (Sudan) were compared to the local one. In the first season, gum yield of the local provenance treated with ethephon was increased by 400-600 % compared to the untreated trees. Gum yield at the semi-arid location was 77, 313 and 214 g/tree with 0, 40 and 120 mg ethephon/tree, respectively, while at the sub-humid location, it was 30, 186 and 114 g/tree with 0, 40 and 120 mg ethephon/tree. However, in the second season, the effect of ethephon was not significant in the semi-arid area, whereas it was evident in the sub-humid area (up to 478 g/tree). Moreover, ethephon did not affect gum yield of provenances from drier areas (Sudan). This showed that the water-stress hypothesis has to be refined. The development of ethephon-based tapping systems is promising, but requires further studies with a wider range of environmental conditions and A. senegal provenances. (Résumé d'auteur)

<http://dx.doi.org/10.1007/s10457-012-9564-y> Cirad-Agritrop Dk : 568015

Articles publiés dans une revue à facteur d'impact

150

Le Provost, G., Domergue, F., Labanne, C., Ramos Campos, P., Grosbois, A., Bert, D., Meredieu, C., Danjon, F., Plomion, C., and Gion, J.-M. (2013)

Soil water stress affects both cuticular wax content and cuticle-related gene expression in young saplings of maritime pine (#*Pinus pinaster*# Ait)

Soil water stress affects both cuticular wax content and cuticle-related gene expression in young saplings of maritime pine (#*Pinus pinaster*# Ait)

BMC Plant Biology vol.13:n°95

Background: The cuticle is a hydrophobic barrier located at the aerial surface of all terrestrial plants. Recent studies performed on model plants, such as *Arabidopsis thaliana*, have suggested that the cuticle may be involved in drought stress adaptation, preventing non-stomatal water loss. Although forest trees will face more intense drought stresses (in duration and intensity) with global warming, very few studies on the role of the cuticle in drought stress adaptation in these long-lived organisms have been so far reported. Results: This aspect was investigated in a conifer, maritime pine (*Pinus pinaster* Ait.), in a factorial design with two genetic units (two half-sib families with different growth rates) and two treatments (irrigated vs non-irrigated), in field conditions. Saplings were grown in an open-sided greenhouse and half were irrigated three times per week for two growing seasons. Needles were sampled three times per year for cuticular wax (composition and content) and transcriptome (of 11 genes involved in cuticle biosynthesis) analysis. Non-irrigated saplings (i) had a higher cuticular wax content than irrigated saplings and (ii) overexpressed most of the genes studied. Both these trends were more marked in the faster growing family. Conclusions: The higher cuticular wax content observed in the non-irrigated treatment associated with strong modifications in products from the decarbonylation pathway suggest that cuticular wax may be involved in drought stress adaptation in maritime pine. This study provides also a set of promising candidate genes for future forward genetic studies in conifers. (Résumé d'auteur)

<http://dx.doi.org/10.1186/1471-2229-13-95> Cirad-Agritrop Dk : 571071

Articles publiés dans une revue à facteur d'impact

8.3.4. Agroforesterie dont le cacaoyer et le cafier

151

Vaast, P., and Somarriba, E. (2014)

Trade-offs between crop intensification and ecosystem services: the role of agroforestry in cocoa cultivation

Trade-offs between crop intensification and ecosystem services: the role of agroforestry in cocoa cultivation

Agroforestry Systems vol.88:n°6

Research published in this special issue on cocoa agroforestry illustrates the multifunctional role of shade trees for sustaining cocoa production and improving farmers' livelihoods, and addresses tradeoffs between higher cocoa yield and the provision of ecosystem services to local households and global society. Indeed, the use of diverse shade in cocoa cultivation is threatened by a new drive towards crop intensification. The removal of shade trees diminishes smallholders' ability to adapt to global change driven by demographic pressure, food insecurity, cocoa price volatility and climate change. Some forms of crop intensification may reduce ecological resilience of cocoa production systems, making adaptation strategies, combining shade trees with innovative management practices, essential for sustaining cocoa yield. Managing trade-offs between yield and environmental services at the cocoa plot and landscape scales requires a multi-disciplinary approach to identify key management options that goes beyond the artificially polarized debates around intensified versus traditional agroforestry practices, or more generally, land-sparing versus land-sharing strategies. The global challenge facing the cocoa sector today is how to increase cocoa production to meet growing demand, without expanding the area under cocoa. This means finding sustainable ways to maintain cocoa production within today's producing regions, particularly West Africa, through a series of technical innovations geared towards smallholders. Inappropriate intensification may result in heavy deforestation on new pioneer fronts, such as the Congo basin, and existing cocoa being replaced either by other agricultural commodities, or by less resilient and less environmentally friendly production practices. (Résumé d'auteur)

<http://dx.doi.org/10.1007/s10457-014-9762-x> Cirad-Agritrop Dk : 574492

Articles publiés dans une revue à facteur d'impact

152

Saj, S., Jagoret, P., and Todem, H. (2013)

Carbon storage and density dynamics of associated trees in three contrasting #Theobroma cacao# agroforests of Central Cameroon

Carbon storage and density dynamics of associated trees in three contrasting #Theobroma cacao# agroforests of Central Cameroon

Agroforestry Systems vol.87:n°6

In Central Cameroon cocoa is mainly produced by household farming systems based on complex associations between cocoa and companion trees. Setup either on native/remnant forest or savannah, these agroforestry systems (AFS) are managed according their geographical position and local pedoclimatic conditions. In this paper, we investigated the effects of local management strategies on carbon (C) storage of live trees in three different cocoa production zones of Central Cameroon. In the 58 fields studied, 8,996 cocoa trees and 1,258 companions were surveyed. Tree sampling was non-destructive and to estimate C storage we used allometric models for above- and belowground biomasses. We measured abundance, height, diameter at breast height and determined species of companion trees. We distinguished between four cocoa plantation age categories (immature, young, mature and senescent) and three preceding systems (forest, forest gallery and savannah). We surveyed farmers' use of each associated tree, allocated it to a functional category and asked if it had been introduced or conserved. Total C content of live trees was on average close to 70 t ha⁻¹. We found that it mostly relied on associated trees-cocoa trees contribution being ac. 2-12 % of live trees total C. The level of contribution to C storage of companions from different use categories differed between sites-trees producing food had contributed most in Bokito and Obala while trees used for shading or fertility contributed most in Ngomedzap. Dynamics of C storage in live trees was found to be independent from cocoa trees growth and age. When aging, AFS continuously lost companion trees and especially conserved ones putatively because of farmers' selective logging. Yet, AFS apparently maintained equivalent C storage abilities with time. Hence, even if cocoa do not contribute significantly to C storage in our study, the systems into which they are included are able to significantly store C and may also contribute to other ecological services such as conservation. (Résumé d'auteur)

<http://dx.doi.org/10.1007/s10457-013-9639-4> Cirad-Agritrop Dk : 571883

Articles publiés dans une revue à facteur d'impact

153

Somarriba, E., Cerda, R., Orozco, L., Cifuentes, M., Dávila, H., Espin, T., Mavisoy, H., Avila, G., Alvarado, E., Poveda, V., Astorga, C., Say, E., and Deheuvels, O. (2013)

Carbon stocks and cocoa yields in agroforestry systems of Central America

Carbon stocks and cocoa yields in agroforestry systems of Central America

Agriculture Ecosystems and Environment vol.173

The cocoa tree (*Theobroma cacao* L.) is cultivated typically in agroforestry systems in close association with a rich list of tree species and other useful plants on the same plot. Cocoa based agroforestry systems are credited for stocking significant amounts of carbon and hence have the potential to mitigate climate change. Since cocoa yields decrease non-linearly with increasing shade, a need is to design optimal cocoa agroforestry systems with high yields and high carbon stocks. We estimated the carbon stocked in a network of 229 permanent sample plots in cacao-based agroforestry systems and natural forests in five Central American countries. Carbon stocks were fractioned by both system compartments (aboveground, roots, soil, litter, dead wood - fine and coarse, and total) and tree use/form (cocoa, timber, fruit, bananas, shade and ornamentals, and palms). Cocoa plantations were assigned to a five-class typology and tested for independence with growing region using contingency analysis. Most Central American cocoa plantations had mixed or productive shade canopies. Only 4% of cocoa plantations were full sun or rustic (cocoa under thinned natural forest). Cocoa tree density was low (548 ± 192 trees ha⁻¹). Total carbon (soil + biomass + dead biomass) was 117 ± 47 Mg ha⁻¹, with 51 Mg ha⁻¹ in the soil and 49 Mg ha⁻¹ (42% of total carbon) in aboveground biomass (cocoa and canopy trees). Cocoa trees accumulated 9 Mg C ha⁻¹ (18% of carbon in aboveground biomass). Timber and fruit trees stored 65% of aboveground carbon. The annual rate of accumulation of carbon in aboveground biomass ranged between 1.3 and 2.6 Mg C ha⁻¹ y⁻¹. Trade-offs between carbon levels and yields were explored qualitatively using functional relationships documented in the scientific and technical literature, and expert knowledge. We argue that it is possible to design cocoa-based AFS with good yields (cocoa and shade canopy) and high carbon stock levels. The botanical composition of the shade canopy provides a large set of morphological and functional traits that can be used to optimize shade canopy design. Our results offer Central American cocoa producers a rigorous estimate of carbon stocks in their cocoa

plantations. This knowledge may help them to certify and sell their cocoa, timber, fruits and other goods to niche markets with good prices. Our results will also assist governments and the private sector in (i) designing better legal, institutional and policy frameworks, local and national, promoting an agriculture with trees and (ii) contributing to the development of the national monitoring, reporting and verification systems required by the international community to access funding and payment for ecosystem services. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.agee.2013.04.013> Cirad-Agritrop Dk : 569107

Articles publiés dans une revue à facteur d'impact

154

Deheuvels, O., Rousseau, G. X., Soto Quiroga, G., Decker Franco, M., Cerda, R., Vilchez, S., and Somarriba, E. (2014)

Biodiversity is affected by changes in management intensity of cocoa-based agroforests

Biodiversity is affected by changes in management intensity of cocoa-based agroforests

Agroforestry Systems vol.88:n°6

In the humid tropics, the rapid rate of deforestation has resulted in a race to protect remaining forest patches that are increasingly isolated within a rapidly expanding agricultural matrix. In these landscapes, a significant area consists of complex agro-forestry systems with high structural and functional plant diversity, providing critical resources for biodiversity conservation, such as food and habitat. Although not a substitute for natural forests, these anthropogenic habitats are gaining increasing conservation value as deforestation progresses. Shaded tree crops, such as cocoa, provide habitats for numerous forest dependent species of high conservation value and play a largely undocumented role in providing other ecological services. Following previous work on the botanical composition and structural complexity of cocoa agroforests in Talamanca (Costa Rica), we assessed if differences in the vegetation composition and structure of 36 cocoa agroforests could affect the wild diversity of small mammals, amphibians, reptiles, soil and litter macro-invertebrates and epiphytes found on cocoa trees and associated plants. Results show that Alpha-diversity is not affected by changes in vegetation structure and composition, except for amphibians and epiphytes found on cocoa trees. However, five taxa among eight showed distinct species composition patterns when compared among cocoa-based agroforestry clusters and with forest control. We showed that beta-diversity assessment enhances our understanding of the effect of management intensification on species composition and on habitat quality. The proper design of the shade component in these AFS will certainly play a key role in segregating wild species hosted in these systems and will open a new field of research for the intensification of both cocoa and associated productions in these highly diverse systems. (Résumé d'auteur)

<http://dx.doi.org/10.1007/s10457-014-9710-9> Cirad-Agritrop Dk : 574498

Articles publiés dans une revue à facteur d'impact

155

Cerda, R., Deheuvels, O., Calvache, D., Niehaus, L., Saenz, Y., Kent, J., Vilchez, S., Villota, A., Martinez, C., and Somarriba, E. (2014)

Contribution of cocoa agroforestry systems to family income and domestic consumption: looking toward intensification

Contribution of cocoa agroforestry systems to family income and domestic consumption: looking toward intensification

Agroforestry Systems vol.88:n°6

While the potential of agroforestry products to contribute to rural livelihoods is well-recognized, the quantification of their yields, incomes, and value for domestic consumption (VDC) and knowledge about their relationships with biodiversity are still scarce. This information is crucial for choosing the best strategy for growing cocoa in tropical landscapes while conserving biodiversity and enhancing ecosystem services. We analyzed the contribution of cocoa agroforestry farming to the incomes and domestic consumption of small farmers' families in 179 cocoa agroforestry systems (CAFS) (254 ha) in five Central American countries. The two hypotheses were: (1) agroforestry products are as important as cocoa in contributing to livelihoods, (2) the typology of CAFS determines the relationships between socioeconomic indicators and yield, biodiversity, and structure of the shade canopy, as well as the relationships between plant species richness and cocoa yield. We quantified the yields of agroforestry products and their contribution to net income, cash flow, and family benefits and developed a typology of CAFS production to evaluate relationships for each CAFS cluster. The main agroforestry products other than cocoa were bananas, oranges, peach palm, other fruits, and timber, which generated modest cash incomes but high VDC at low cash costs, thus contributing to family

savings and food security. Timber volumes and harvest rates were low but significant increase was deemed feasible. The contribution of the set of agroforestry products to family benefits was similar or higher than cocoa, depending on the typology of the CAFS. Intensified highly diverse-dense CAFS demonstrated remarkably higher yields, net income, cash flow, and family benefits, and had more synergistic relationships than extensive CAFS and traditional highly diverse-dense CAFS, which showed more trade-offs. Our findings point to intensified highly diverse-dense CAFS as feasible for farming within a land-sparing strategy. Further research is needed to better understand the mechanisms that could regulate synergies or trade-offs to improve this type of intensification. (Résumé d'auteur)

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Articles publiés dans une revue à facteur d'impact

156

Somarriba, E., Suarez-Islas, A., Calero-Borge, W., Villota, A., Castillo, C., Vilchez, S., Deheuvels, O., and Cerda, R. (2014)

Cocoa-timber agroforestry systems: #Theobroma cacao-Cordia alliodora# in Central America

Cocoa-timber agroforestry systems: #Theobroma cacao-Cordia alliodora# in Central America

Agroforestry Systems vol.88:n°6

Cocoa-timber systems have been proposed as viable alternative for simultaneously satisfying the livelihood needs of the farmers (in terms of production of cocoa and other goods for family use or sale) while improving the capacity of the cocoa agroforestry system to provide other ecosystem services at both the plot and landscape level. In this paper we explored the demographics, population dynamics and timber yield of naturally regenerated laurel (*Cordia alliodora* R&P Oken) in 33 ha of cocoa plantations (42 farms) inventoried in 2001 and re-measured in 2005 and 2011, in Talamanca, Costa Rica. This study shows in quantitative terms the significant contribution of laurel timber in the shade canopy of cocoa to annual income (use or sale of timber) and family savings (timber in standing, harvestable trees). In the study region, laurel yields 4.43 m³ ha⁻¹ year⁻¹, equivalent to an annual income of 265 US\$ ha⁻¹ year⁻¹ (assuming that 50 % of total standing volume is saleable, at 120 US\$ m⁻³ for standing laurel timber at the farm). In addition to the cash flow, standing, harvestable laurel trees (43.89 m³ ha⁻¹) amounts to 2,633 US\$ ha⁻¹ in family savings. (Résumé d'auteur)

<http://dx.doi.org/10.1007/s10457-014-9692-7> Cirad-Agritrop Dk : 574496

Articles publiés dans une revue à facteur d'impact

157

Meylan, L., Mérot, A., Gary, C., and Rapidel, B. (2013)

Combining a typology and a conceptual model of cropping system to explore the diversity of relationships between ecosystem services: The case of erosion control in coffee-based agroforestry systems in Costa Rica

Combining a typology and a conceptual model of cropping system to explore the diversity of relationships between ecosystem services: The case of erosion control in coffee-based agroforestry systems in Costa Rica

Agricultural systems vol.118

With increasing pressure on farmers to improve the performance of their cropping systems, there is a growing need to design cropping systems that respond concurrently to environmental, agronomic and socioeconomic constraints. However, the trade-offs between ecosystem services, including provisioning services, can vary considerably from plot to plot. Using a typology of agricultural practices to adapt a conceptual model of the cropping system can provide an instrument to support the design of cropping systems that take into account the diversity of environmental and socioeconomic conditions and trade-offs within a study site. This method was tested to design coffee-based agroforestry systems mitigating soil erosion in central Costa Rica, a case study with a high-value crop in a complex relationship to its biophysical environment. A generic plot-scale conceptual model representing the effect of agricultural practices and environmental factors was designed, with erosion reduction, coffee production and gross margin as the outputs. Quantitative data on agricultural practices and costs were then collected over two years on a sample of plots in an 18 km² watershed upstream of a hydroelectric dam. A typology of these plots was built based on agricultural management practices; the resulting groups were further characterized by socioeconomic and environmental variables. The critical variables from each group of plots were used to adapt the conceptual model to the groups from the typology. The four groups found were (1) lowintensity management; (2) intensive management; (3) shaded agroecosystem, and (4) intensive agrochemical management. The conceptual model helped analyze the key processes and trade-offs for each group

and helped make recommendations of adapted erosion control practices. The model showed that for some groups, less time-consuming erosion control actions not impacting coffee production might be more suitable, such as drainage canals, terraces, and vegetative barriers. In contrast, other groups had better socioeconomic or environmental conditions that opened the possibility of using shade trees or manual weed control (as opposed to herbicide use) to control erosion. This method finds its application in the plot-scale design and prototyping of agricultural systems that better respond to specific constraints, and can provide more relevant basis for discussion with farmers in participative methods. It also presents the advantage of requiring little data acquisition, although it can be further developed through integrating numerical relationships for quantitative modeling. (Résumé d'auteur)
<http://dx.doi.org/10.1016/j.agry.2013.02.002> Cirad-Agritrop Dk : 568545

Articles publiés dans une revue à facteur d'impact

158

Cubry, P., De Bellis, F., Pot, D., Musoli, P., and Leroy, T. (2013)

Global analysis of #Coffea canephora# Pierre ex Froehner (Rubiaceae) from the Guineo-Congolese region reveals impacts from climatic refuges and migration effects

Global analysis of #Coffea canephora# Pierre ex Froehner (Rubiaceae) from the Guineo-Congolese region reveals impacts from climatic refuges and migration effects

Genetic resources and crop evolution vol.60:n°2

As the second species used for commercial coffee, evaluation of Coffea canephora Pierre ex Froehner population genetics is a challenging task for coffee breeding. This study examined the pattern of genetic variability and genetic relationships of cultivated and wild populations of C. canephora sampled across the Guineo-Congolese region of Africa and some improved populations maintained in field genebanks. A total of 293 individuals, sampled from 17 populations, were genotyped with 39 nuclear microsatellite markers. Genetic diversity and structure were investigated with both a model-based and a graphical approach; isolation by distance was also tested. Relationships between the diversity clusters are discussed with regard to differentiation due to several glacial refuges during the Last Glacial Maximum (LGM). High genetic diversity within C. canephora is confirmed with a mean number of alleles of 11.85 per marker, a mean gene diversity of 0.72 and a mean observed heterozygosity of 0.36. An overall structure of two main groups (Guinean and Congolese) subdivided in six subgroups (2 for the Guinean and 4 for the Congolese) was found, including one described for the first time in the Guinean group. A fine structure within the Guinean group was also newly detected. Genetic structure of C. canephora appears to be consistent with its geographic repartition at the continent scale. Structure of diversity was found in accordance with localizations of refuge zones during LGM and migration from this period. Results from this genetic structure study raise our capabilities to better manage and use the collections of genetics resources for breeding purposes. Those results will be used in future association studies to optimize the number of genotypes to be phenotyped. (Résumé d'auteur)

<http://dx.doi.org/10.1007/s10722-012-9851-5> Cirad-Agritrop Dk : 567363

Articles publiés dans une revue à facteur d'impact

159

Taugourdeau, S., Le Maire, G., Avelino, J., Jones, J. R., Ramirez, L. G., Jara Quesada, M., Charbonnier, F., Gómez-Delgado, F., Harmand, J.-M., Rapidel, B., Vaast, P., and Roupsard, O. (2014)

Leaf area index as an indicator of ecosystem services and management practices: An application for coffee agroforestry

Leaf area index as an indicator of ecosystem services and management practices: An application for coffee agroforestry

Agriculture Ecosystems and Environment vol.192

Scalable indicators are promising to assess ecosystem services. In a large (660 ha) coffee agroforestry farm, we calibrated the relationship between the Normalized Difference Vegetation Index (NDVI), calculated on a High Resolution (HR) satellite image and ground-truth LAI, providing a 2-layer (shade trees and coffee) LAI calibration with LAI 2000 and a new technique based on the cumulative distribution of LAI along transects. The effective and apparent clumping of coffee leaves were computed (0.76 and 0.89, respectively). We also calibrated the relationship between the derived HR-LAI farm map and NDVI from the Moderate Resolution Imaging Spectroradiometer (MODIS) in order to reconstruct LAI time-series (2001-2011). Coffee LAI, as derived from MODIS after subtracting the contribution of shade tree LAI varied seasonally between 2.4 and 4.4 m²m⁻², with a maximum by the end of wet season (peak of harvest), steep declined during the drier-cooler season, minimum after

annual coffee pruning, recovery during the next rainy season and pause during the grain filling period. MODIS also detected significant inter-annual variations in LAI originating from annual pruning, or plot renovation followed by a progressive LAI recovery during up to 4 years. We related the coffee-LAI time-series with farm registries to examine the impacts of management on LAI and on selected ecosystem services, namely yield and hydrological services. Nitrogen fertilization was adjusted annually by the farmer and appeared as the best yield predictor ($R^2 = 0.53$). Combining N-fertilization with LAI from 6 significant months of the year, the prediction was improved ($R^2 = 0.74$), confirming LAI as an important co-predictor of yield. We ended up with a yield prediction model including also the percentage of pruned resprouts ($R^2 = 0.79$), with potential uses for regional yield mapping or reconstruction of historical yield time-series. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.agee.2014.03.042> Cirad-Agritrop Dk : 573442

Articles publiés dans une revue à facteur d'impact

160

Cannava, P., Harmand, J.-M., Zeller, B., Vaast, P., Ramirez, J. E., and Dambrine, E. (2013)

Low nitrogen use efficiency and high nitrate leaching in a highly fertilized #Coffea arabica-Inga densiflora# agroforestry system: A ^{15}N labeled fertilizer study

Low nitrogen use efficiency and high nitrate leaching in a highly fertilized #Coffea arabica-Inga densiflora# agroforestry system: A ^{15}N labeled fertilizer study

Nutrient cycling in agroecosystems vol.95:n°3

In intensive cultivation of coffee (*Coffea arabica* L.), large N fertilizer inputs are thought to increase nitrate (NO_3^-) water contamination and greenhouse gas emissions. This study was carried out (1) to evaluate the nitrogen use efficiency of a highly fertilized *C. arabica*-*Inga densiflora* agroforestry system on an Andosol and (2) to determine the control mechanisms of N fluxes and losses. Nitrogen pools and fluxes were monitored for one cropping season in a coffee plantation (density 4,722 plants ha^{-1} , height 2.1 m), shaded by regularly pruned leguminous trees (density 278 trees ha^{-1} ; height 8 m), in the Central Valley of Costa Rica. The fate of N fertilizer (250 kg N ha^{-1} year $^{-1}$) was traced by adding ^{15}N -urea at 1.61 kg ^{15}N ha^{-1} . The labeled urea was rapidly nitrified or immobilized in soil organic matter with 20.8 % recovered in organic form at the end of the cropping season in the top 2 m of the soil. There was high net N mineralization and nitrification in the top soil (&200 kg N ha^{-1} year $^{-1}$ in 0-10 cm) and up to 257 kg NO_3^- -N ha^{-1} were found in the top 2 m of the soil. Only 25.2 % (63 kg N ha^{-1}) of the applied fertilizer (^{15}N recovery) was taken up by the two plant species (13.5 % in the coffee plants, 9.6 % in the shade trees and 2.1 % in the litter). Total N export in the coffee fruit harvest accounted for 110 kg N ha^{-1} but only 17.6 kg N ha^{-1} came from the applied fertilizer (7 % of ^{15}N recovery). During this year of high coffee production, the coffee plant acquired most of its N from mineralized soil N rather than from N fertilizer. High fertilization resulted in at 22.7 kg N ha^{-1} year $^{-1}$ (Ndfa of 16.1 %). As a result of high water drainage (1,745 mm for a total rainfall of 2,678 mm), the main fate of N fertilizer was NO_3^- leaching (33-55 % of ^{15}N recovery). The annual NO_3^- -N leaching at a depth of 120 cm was 157.2 kg N ha^{-1} year $^{-1}$ (including 82.8 from applied N) and the N_2O -N emission was 5.8 kg N ha^{-1} year $^{-1}$. These results clearly showed that the system was N saturated, leading to low use efficiency of the N fertilizer and significant losses of N, principally through NO_3^- leaching. This study provided an insight on how to reduce the negative environmental impact of N fertilization in intensive coffee cultivation and increase N use efficiency. (Résumé d'auteur)

<http://dx.doi.org/10.1007/s10705-013-9571-z> Cirad-Agritrop Dk : 570117

Articles publiés dans une revue à facteur d'impact

161

Combes, M.-C., Dereeper, A., Severac, D., Bertrand, B., and Lashermes, P. (2013)

Contribution of subgenomes to the transcriptome and their intertwined regulation in the allopolyploid #Coffea arabica# grown at contrasted temperatures

Contribution of subgenomes to the transcriptome and their intertwined regulation in the allopolyploid #Coffea arabica# grown at contrasted temperatures

New phytologist vol.200:n°1

Polyplody has occurred throughout the evolutionary history of plants and led to diversification and plant ecological adaptation. Functional plasticity of duplicate genes is believed to play a major role in the environmental adaptation of polyploids. In this context, we characterized genome-wide homoeologous gene expression in *Coffea arabica*, a recent allopolyploid combining two subgenomes that derive from two closely related diploid species, and investigated its variation in response to changing environment. The transcriptome of leaves of *C. arabica* cultivated at different growing temperatures suitable for one or the other parental species was examined using RNA-sequencing.

The relative contribution of homoeologs to gene expression was estimated for 9959 and 10 628 genes in warm and cold conditions, respectively. Whatever the growing conditions, 65% of the genes showed equivalent levels of homoeologous gene expression. In 92% of the genes, relative homoeologous gene expression varied < 10% between growing temperatures. The subgenome contributions to the transcriptome appeared to be only marginally altered by the different conditions (involving intertwined regulations of homeologs) suggesting that *C. arabica*'s ability to tolerate a broader range of growing temperatures than its diploid parents does not result from differential use of homoeologs. (Résumé d'auteur)

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Articles publiés dans une revue à facteur d'impact

162

Pereira Freire, L., Marraccini, P., Costa Rodrigues, G., and Carvalho Andrade, A. (2013)

Analise da expressão do gene manose 6 fosfato redutase em cafeeiros submetidos ao déficit hídrico

Analise da expressão do gene manose 6 fosfato redutase em cafeeiros submetidos ao déficit hídrico
Coffee Science vol.8:n°1

The effects of water deficit on the gene CaM6PR expression, encoding mannose -6- phosphate reductase, were evaluated in coffee trees in the formation phase of coffee cultivars IAPAR59 (Villa Sarchi x Timor hybrid HT832 / 2) and RUBI MG 1192 (Mundo Novo x Catuaí) of Coffea arabica, respectively regarded as tolerant and sensitive to water stress. The cultivars were planted in December 2007 in the experimental field of Embrapa Cerrados - DF (CPAC) and cultured for two years (2008 and 2009) with (I) and without (NI) irrigation. For each year two assessments were carried out (P1 , not stressed, during the rainy season and P2 , dry season). For both cultivars, the CaM6PR gene expression measured in leaves through quantitative PCR, showed a strong increase in the dry season for non-irrigated plants when compared with irrigated plants. In addition, the expression of this gene was always greater in IAPAR59 than in RUBI MG 1192. Also, there was an increased expression of this gene in 2008 when compared to 2009. This difference could be a direct consequence of drought stress levels received by plants, since drought conditions in 2008 were more severe than in 2009. Thus, in this work, we propose the use of the CaM6PR gene as a molecular marker to evaluate the stress level of the coffee plants submitted to water deficit. (Résumé d'auteur)

<http://coffeescience.ufla.br/index.php/Coffeescience/article/view/306> Cirad-Agritrop Dk : 568778

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

163

Charbonnier, F. (2013)

Mesure et modélisation des bilans de lumière, d'eau, de carbone et de productivité primaire nette dans un système agroforestier à base de caféier au Costa Rica. Thèse, Université de Lorraine, CIRAD-PERSYST-UMR Eco&Sols. 231 p.

Comparés aux monocultures, les systèmes agroforestiers (SAF) sont censés permettre une meilleure efficience d'utilisation de la ressource et améliorer les services écosystémiques. Cependant, la complexité des interactions se produisant dans les SAF rend délicate la quantification et la décomposition des effets des arbres d'ombrage sur la productivité primaire nette (NPP) de la culture principale. Peu de modèles sont capables d'analyser les effets des interactions entre culture principale et arbres d'ombrage sur les échanges de CO₂ et d'eau. En effet, les interactions pour la lumière, l'eau et la chaleur se produisant entre culture et arbres d'ombrage peuvent produire des effets contre-intuitifs sur la photosynthèse, l'efficience d'utilisation de la lumière (LUE), l'efficience de transpiration et le microclimat. Nous montrons que MAESPA, un modèle 3D mécaniste, peut-être utilisé pour étudier la variabilité de ces processus à des échelles allant de la plante à la parcelle, et de la demi-heure à l'année entière. MAESPA a simulé de manière satisfaisante l'interception de la lumière dans un SAF à base de caféier composé de 2 couches hétérogènes. Des variables modélisées par MAESPA ont été utilisées pour produire de puissantes variables explicatives dans un dispositif expérimental étudiant les déterminants de la NPP aérienne (ANPP) du caféier. Il a été démontré que LUE était deux fois plus élevée pour les caféiers poussant à l'ombre ce qui compensait totalement la diminution de leurs budgets lumineux, résultant en une absence de différence de ANPP entre caféiers de plein soleil et caféiers d'ombrage. MAESPA a aussi simulé de manière satisfaisante les échanges de CO₂ à l'échelle du caféier et à l'échelle de la parcelle, lorsque comparés à des mesures d'échanges gazeux dans des chambres plantes entières ou à des enregistrements de flux turbulents au-dessus de la canopée, respectivement. Nous avons utilisé MAESPA pour simuler la variabilité spatiale de la photosynthèse et de LUE. MAESPA a démontré être un modèle robuste pour quantifier

les interactions spatiales dans un SAF. Le prochain développement pertinent de cette approche serait de coupler MAESPA avec un modèle d'allocation du carbone dans les organes des plants de cafiers. (Résumé d'auteur)

Cirad-Agritrop Dk : 573949

164

Bessou, C., Basset-Mens, C., Tran, T., and Benoist, A. (2013)

LCA applied to perennial cropping systems: a review focused on the farm stage

LCA applied to perennial cropping systems: a review focused on the farm stage

International journal of life cycle assessment vol.18:n°2

Purpose Perennial crops globally provide a lot of fruit and other food products. They may also provide feedstock for bioenergy and have been, notably to this end, the subject of several LCA-based studies mostly focusing on energy and GHG balances. The purpose of this review was to investigate the relevance of LCAs on perennial crops, especially focusing on how the perennial crop specificities were accounted for in the farm stage modelling. Methods More than 100 papers were reviewed covering 14 products from perennial crops: apple, banana (managed over several years), orange and other citrus fruits, cocoa, coconut, coffee, grape fruit, Jatropha oil, kiwi fruit, palm oil, olive, pear and sugarcane. These papers were classified into three categories according to the comprehensiveness of the LCA study and depending on whether they were peer-reviewed or not. An in-depth analysis of the goal and scope, data origin for farming systems, modelling approach for the perennial cropping systems and methods and data for field emissions helped reveal the more critical issues and design some key recommendations to account better for perennial cropping systems in LCA. Results and discussion In the vast majority of the reviewed papers, very little attention was paid on integrating the perennial cropping cycle in the LCA. It is especially true for bioenergy LCA-based studies that often mostly focused on the industrial transformation without detailing the agricultural raw material production, although it might contribute to a large extent to the studied impacts. Some key parameters, such as the length of the crop cycle, the immature and unproductive phase or the biannual yield alternance, were mostly not accounted for. Moreover, the lack of conceptual modelling of the perennial cycle was not balanced by any attempt to represent the temporal variability of the system with a comprehensive inventory of crop managements and field emissions over several years. Conclusions According to the reviewed papers and complementary references, we identified the gaps in current LCA of perennial cropping systems and proposed a road map for scientific researches to help fill-in the knowledge-based gaps. We also made some methodological recommendations in order to account better for the perennial cycle within LCA considering the aim of the study and data availability. (Résumé d'auteur)

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Articles publiés dans une revue à facteur d'impact

8.4. Productions végétales sauf agroforesterie (café, cacao)

165

Ozier Lafontaine, H., and Lesueur Jannoyer, M. (2014)

Sustainable agriculture reviews 14 : agroecology and global change, Springer [Allemagne], Heidelberg. XIV-511 p.

<http://dx.doi.org/10.1007/978-3-319-06016-3> Cirad-Agritrop : BA_F08 OZI 5885 Dk : 573950

166

Alle, U. C., Vissoh, P. V., Guibert, H., Agbossou, E. K., Gozé, E., and Afouda, A. (2013)

Changements climatiques, perceptions et adaptations des producteurs sur le plateau d'Allada au sud du Bénin

Changements climatiques, perceptions et adaptations des producteurs sur le plateau d'Allada au sud du Bénin

European Journal of Scientific Research vol.107:n°4

La présente étude analyse les perceptions qu'ont les producteurs des changements climatiques, leur cohérence avec les observations climatiques et les mesures d'adaptation adoptées par les producteurs sur le plateau d'Allada au sud du Bénin. A cet effet, les données liées à la pluviométrie, la température et les vents ont été analysées entre 1951 et 2010. Les perceptions et mesures d'adaptation des producteurs ont été collectées à l'aide d'un questionnaire structuré auprès de 201 producteurs sur le plateau d'Allada en 2010. Lors de l'analyse, les producteurs ont été classés en trois groupes selon leur âge : i) moins de 41 ans, ii) entre 41 et 55 ans et plus de 55 ans. Le test de χ^2 a été utilisé pour vérifier si les perceptions des producteurs sont indépendantes de leur âge. Pour chaque

groupe, le nombre de personnes ayant adopté une mesure d'adaptation donnée à été calculé. Le tableau de contingence obtenu a été soumis à une analyse factorielle des correspondances. Les perceptions des producteurs et les observations climatiques ne convergent pas toujours. En outre, l'âge influence les perceptions des producteurs et détermine l'adoption des mesures d'adaptation. Il importe de comprendre la cause des divergences entre perceptions et observations climatiques. (Résumé d'auteur)

Cirad-Agritrop Dk : 570319

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

167

Diarra, A., Barbier, B., and Yacouba, H. (2013)

Adaptation de l'agriculture sahélienne aux changements climatiques : une approche par la modélisation stochastique

Adaptation de l'agriculture sahélienne aux changements climatiques : une approche par la modélisation stochastique

Sécheresse vol.24:n°1

L'objectif de cet article est d'étudier la réponse de l'agriculteur sahélien aux sécheresses de plus en plus récurrentes prévues par le Groupe d'experts intergouvernemental sur l'évolution du climat (GIEC), d'évaluer les pertes qu'elles occasionnent et, enfin, de s'interroger sur les façons de remédier, au moins partiellement, à leurs effets négatifs. Nous avons montré, à partir d'un modèle stochastique, que l'impact d'une augmentation de la fréquence de mauvaises années de production reste très coûteux pour l'agriculteur sahélien. Lorsque le risque de mauvaises années est multiplié par 3,5, l'agriculteur voit sa richesse baisser de 34 % par rapport à sa richesse initiale, et ce malgré une réorganisation des systèmes de cultures vers des spéculations plus résistantes à la sécheresse. Nous avons ensuite montré que le paysan est prêt à payer 21 % de sa richesse, soit 44 862 francs CFA par an, pour éviter toute forme de risque dans l'exercice de son activité agricole. Il est donc disposé à contribuer au financement de technologie comme l'irrigation pour garantir un certain niveau de revenu. Enfin, nous avons montré qu'une information sur le risque de mauvaise année, transmise de façon précoce aux agriculteurs permet de limiter de manière significative leur perte de richesse et de réduire les aides alimentaires. (Résumé d'auteur)

<http://dx.doi.org/10.1684/sec.2013.0371> Cirad-Agritrop Dk : 568776

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

168

Gérardeaux, E., Sultan, B., Palai, O., Guiziou, C., Oettli, P., and Naudin, K. (2013)

Positive effect of climate change on cotton in 2050 by CO₂ enrichment and conservation agriculture in Cameroon

Positive effect of climate change on cotton in 2050 by CO₂ enrichment and conservation agriculture in Cameroon

Agronomy for sustainable development vol.33:n°3

This article predicts an unexpected positive effect of climate change on cotton production in Cameroon. Global warming could threaten cotton production in Africa due to increasing temperature and CO₂, and rainfall uncertainties. This situation is worsened by the fact that most African farmers grow cotton as their cash crop and have few or no possible alternatives. Assessing the impact of climate change on cotton production is therefore critical. Here, we used CROPGRO, a process-based crop model that can simulate the main features of cotton growth and management. We applied this model to two regions in North Cameroon and a set of six regional climate projections combining general climate models and regional climate models from the ENSEMBLES project. The model was calibrated and validated with a data set of observations made in farmer fields from 2001 to 2005 and at an experimental station in 2010. Our results show unexpectedly that climate change from 2005 to 2050 in North Cameroon will have a positive effect on cotton yields with an increase of 1.3 kg ha⁻¹ year⁻¹ in yield, especially if conservation agriculture systems are adopted. The predicted increase of 0.05 °C year⁻¹ in temperature will shorten crop cycles by 0.1 day year⁻¹ with no negative effect on yields. Moreover, the fertilizing effect of CO₂ enrichment will increase yields by approximately 30 kg ha⁻¹. The rainfall pattern is likely to change, but the six regional models used to generate future weather patterns did not predict a decrease in rainfall. One model even forecast an increase in rainfall amounts. According to our findings, climate changes in North Cameroon can be anticipated by tailoring alternative cropping systems and adaptation techniques to cope with climate change. (Résumé d'auteur)

<http://dx.doi.org/10.1007/s13593-012-0119-4> Cirad-Agritrop Dk : 569325

Articles publiés dans une revue à facteur d'impact

169

Bassu, S., Brisson, N., Durand, J.-L., Boote, K. J., Lizaso, J., Jones, J. W., Rosenzweig, C., Ruane, A. C., Adam, M., Baron, C., Basso, B., Biernath, C., Boogaard, H., Conjin, S., Corbeels, M., Deryng, D., De Sanctis, G., Gayler, S., Grassini, P., Hatfield, J. L., Hoek, S. B., Izaurrealde, C., Jongschaap, R., Kemanian, A., Kersebaum, K. C., Kim, S.-H., Kumar, N. S., Makowski, D., Müller, C., Nendel, C., Priesack, E., Pravia, M. V., Sau, F., Shcherbak, I., Tao, F., Teixeira, E., Timlin, D., and Waha, K. (2014)

How do various maize crop models vary in their responses to climate change factors?

How do various maize crop models vary in their responses to climate change factors?

Global change biology vol.20:n°7

Potential consequences of climate change on crop production can be studied using mechanistic crop simulation models. While a broad variety of maize simulation models exist, it is not known whether different models diverge on grain yield responses to changes in climatic factors, or whether they agree in their general trends related to phenology, growth, and yield. With the goal of analyzing the sensitivity of simulated yields to changes in temperature and atmospheric carbon dioxide concentrations [CO₂], we present the largest maize crop model intercomparison to date, including 23 different models. These models were evaluated for four locations representing a wide range of maize production conditions in the world: Lusignan (France), Ames (USA), Rio Verde (Brazil) and Morogoro (Tanzania). While individual models differed considerably in absolute yield simulation at the four sites, an ensemble of a minimum number of models was able to simulate absolute yields accurately at the four sites even with low data for calibration, thus suggesting that using an ensemble of models has merit. Temperature increase had strong negative influence on modeled yield response of roughly 0.5 Mg ha⁻¹ per °C. Doubling [CO₂] from 360 to 720 μmol mol⁻¹ increased grain yield by 7.5% on average across models and the sites. That would therefore make temperature the main factor altering maize yields at the end of this century. Furthermore, there was a large uncertainty in the yield response to [CO₂] among models. Model responses to temperature and [CO₂] did not differ whether models were simulated with low calibration information or, simulated with high level of calibration information. (Résumé d'auteur)

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Articles publiés dans une revue à facteur d'impact

170

Leclerc, C., Mwongera, C. N., Camberlin, P., and Moron, V. (2014)

Cropping system dynamics, climate variability, and seed losses among East African smallholder farmers: A retrospective survey

Cropping system dynamics, climate variability, and seed losses among East African smallholder farmers: A retrospective survey

Weather, climate, and society vol.6:n°3

Climate variability directly affects traditional low input and rain-fed farming systems, but few studies have paid attention retrospectively to the cropping system's ability to mitigate climate risk. This study analyzes the impacts of rainfall variability on farmers' seed variety losses over time, considering changes in smallholder farming systems. The cropping system dynamics, in favoring maize at the expense of sorghum and pearl millet, have induced an increasing risk of seed loss during drought. Combining ecological anthropology and climatology, a retrospective survey asking farmers about the period 1961-2006 was carried out at three altitudinal levels (750, 950, and 1100 m) on the eastern slope of Mount Kenya. Over that period, based on 3204 seed loss events reported orally and independently by 208 farmers, the probability to lose sorghum seed (0.056-0.065) was significantly lower than the probability to lose maize seed (0.071-0.087). All crops were more impacted by droughts than by very wet years. Seed loss probability increased for rainy seasons shorter than 50 days, with less than 28 rain days, and with a precipitation amount under 400 mm. Losses are almost linearly related to the frequency of rain days. Logistic regression confirmed that a change in cropping systems, favoring maize at the expense of sorghum and pearl millet, increased the risk of seed losses due to drought over the 46-yr period. (Résumé d'auteur)

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Articles publiés dans une revue à facteur d'impact

171

Traore, B. (2014)

Climate change, climate variability and adaptation options in smallholder cropping systems of the Sudano - Sahel region in West Africa. Thèse, Wageningen University

Wageningen University, CIRAD-PERSYST-UPR AIDA, Wageningen. 163 p.

La variation des rendements de coton est liée à la distribution des précipitations et en particulier aux périodes de sécheresse intra-annuelle (intervalle sans pluies). Dans les zones à faible pluviométrie, les rendements de maïs sont positivement corrélés à la fréquence des pluies. L'étude montre que la production de coton dans le sud du Mali est affectée par le changement climatique, en particulier par des modifications dans la distribution des pluies. En 2010 et 2011, une étude a été menée au Mali (Try et N'Goukan) pour comprendre la perception des agriculteurs sur la variabilité et les changements climatiques, et pour évaluer des options d'adaptation à ces changements climatiques. Ces options sont basées sur l'amélioration de la gestion tactique des dates de semis et de l'utilisation des engrains minéraux. Il en résulte que les agriculteurs ont perçu une augmentation de la variation interannuelle des précipitations, une augmentation de la fréquence des intervalles de sécheresse au cours la saison des pluies, et une augmentation de la température moyenne. Dans l'ensemble, ces perceptions des agriculteurs sont conformes aux observations météorologiques. Pour faire face à la variabilité climatique, les stratégies d'adaptation envisagées par les agriculteurs portent sur l'utilisation des variétés tolérantes à la sécheresse, des variétés à cycle court et le choix de dates de semis appropriées. Nos essais expérimentaux avec les agriculteurs montrent que l'utilisation de l'engrais chimique améliore les rendements de maïs et de mil. Cependant elle ne semble rentable que pour la culture de maïs bien que le rendement de mil soit significativement augmenté. Enfin, pour améliorer les capacités d'adaptation des agriculteurs, il serait souhaitable de les sensibiliser sur les principales caractéristiques du climat et de sa variabilité, et surtout sur la gestion du calendrier cultural au début de la saison des pluies. Afin d'évaluer les options techniques d'adaptation à la variabilité climatique, un essai expérimental a été réalisé de 2009 à 2011 (Station de Recherche Agricole de N'Tarla). L'effet des dates de semis (précoce, moyenne et tardive) sur le rendement de trois variétés (cycle long, moyen et court) des quatre principales cultures pluviales (maïs, mil, sorgho et coton) ont été évalués. Les résultats montrent que le rendement moyen du maïs obtenu au cours des trois saisons agricoles est supérieur de 57% et 45% à celui du mil et du sorgho, respectivement. L'analyse des données météorologiques sur les quatre dernières décennies confirme que ce résultat peut être valable sur une période aussi longue que celle la durée de l'étude. Bien que le semis tardif ait occasionné une baisse significative des rendements de maïs, de sorgho et de coton, ceci n'a pas été observé pour les rendements de mil. La variété à cycle court de mil semble donc mieux adaptée pour les semis tardifs. Lorsque la saison des pluies commence tardivement, le semis de sorgho peut être retardé de début Juin à début Juillet sans réductions significatives du rendement. Le rendement de coton avec la date de semis précoce était 28% supérieur au rendement obtenu avec la date de semis moyenne. Pour les trois variétés (cycle long, moyen et court), le plus faible rendement a été obtenu avec le semis tardif. Les dates de semis en interaction avec les variétés ont un effet significatif sur les rendements de mil et de sorgho. Pour les rendements de maïs et de coton, la meilleure date de semis a été plus affectée par les conditions météorologiques. Les résultats de cette étude constituent une contribution majeure aux pratiques d'adaptation à la variabilité climatique. La priorité doit être accordée au semis du coton en début de la saison des pluies; le maïs est la meilleure option si l'engrais minéral est disponible; les semis du maïs et du sorgho peuvent être retardés jusqu'en début juillet sans une répercussion majeure sur le rendement et le mil doit être planté en dernier. Afin d'analyser l'impact des changements du futur climat sur les systèmes de production du maïs et du mil, nous avons utilisé des projections climatiques (2040-2069) pour la zone Soudano Sahélienne du Mali. Ces informations ont été ensuite couplées au modèle de culture APSIM (Simulateur des Systèmes de Production Agricole). Pour les cinquante prochaines années, nous avons analysé les changements de la pluviométrie, la température maximale et minimale et avons testé deux scénarios climatiques correspondant à une force radiative de 4,5 Wm⁻² (scenario rcp4.5) et 8,5 Wm⁻² (scenario rcp8.5); nous avons ensuite évalué l'impact des changements du climat des années à venir sur les rendements de maïs et de mil, et ainsi évalué les options d'adaptation à ce changement. Les principaux résultats indiquent qu'au Mali, la température augmentera au cours de la période 2040-2069 dans le temps et cette augmentation sera plus forte avec le scénario rcp8.5. Dans l'ensemble la tendance de la pluviométrie annuelle varie peu. Les pertes de rendements de maïs seraient de 45% et 47% respectivement pour les scénarios rcp4.5 et rcp8.5. L'application des doses recommandées d'engrais minéraux ne permettrait pas permis de compenser l'impact du changement climatique mais elle réduirait significativement les pertes de rendement. Pour le mil, la perte de rendement est de 16% et 14% respectivement pour les scénarios de rcp4.5 et rcp8.5. Si les doses d'engrais recommandées sont appliquées, ces pertes de rendement sont inversées dans les deux scénarios climatiques. Cette étude montre que faire face à la variabilité du climat et au changement climatique peut être possible: les

perdes de rendement dues aux variations climatiques peuvent être compensées avec un choix adéquat des cultures et variétés, ainsi que l'amélioration des pratiques culturales (semis et fertilisation). (Résumé d'auteur)

Cirad-Agritrop Dk : 575092

172

Traoré, B. S., Corbeels, M., Van Wijk, M. T., Rufino, M. C., and Giller, K. E. (2013)

Effects of climate variability and climate change on crop production in southern Mali

Effects of climate variability and climate change on crop production in southern Mali

European journal of agronomy vol.49

In West Africa predictions of future changes in climate and especially rainfall are highly uncertain, and up to now no long-term analyses are available of the effects of climate on crop production. This study analyses long-term trends in climate variability at N'Tarla and Sikasso in southern Mali using a weather dataset from 1965 to 2005. Climatic variables and crop productivity were analysed using data from an experiment conducted from 1965 to 1993 at N'Tarla and from a crop yield database from ten cotton growing districts of southern Mali. Minimum daily air temperature increased on average by 0.05°C per year during the period from 1965 to 2005 while maximum daily air temperature remained constant. Seasonal rainfall showed large inter-annual variability with no significant change over the 1965-2005 period. However, the total number of dry days within the growing season increased significantly at N'Tarla, indicating a change in rainfall distribution. Yields of cotton, sorghum and groundnut at the N'Tarla experiment varied (30%) without any clear trend over the years. There was a negative effect of maximum temperature, number of dry days and total seasonal rainfall on cotton yield. The variation in cotton yields was related to the rainfall distribution within the rainfall season, with dry spells and seasonal dry days being key determinants of crop yield. In the driest districts, maize yields were positively correlated with rainfall. Our study shows that cotton production in southern Mali is affected by climate change, in particular through changes in the rainfall distribution. (Résumé d'auteur)

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Articles publiés dans une revue à facteur d'impact

173

Sultan, B., Roudier, P., Quirion, P., Alhassane, A., Muller, B., Dingkuhn, M., Ciais, P., Guimbertea, M., Traoré, S. B., and Baron, C. (2013)

Assessing climate change impacts on sorghum and millet yields in the Sudanian and Sahelian savannas of West Africa

Assessing climate change impacts on sorghum and millet yields in the Sudanian and Sahelian savannas of West Africa

Environmental research letters vol.8:n°014040

Sub-Saharan West Africa is a vulnerable region where a better quantification and understanding of the impact of climate change on crop yields is urgently needed. Here, we have applied the process-based crop model SARRA-H calibrated and validated over multi-year field trials and surveys at eight contrasting sites in terms of climate and agricultural practices in Senegal, Mali, Burkina Faso and Niger. The model gives a reasonable correlation with observed yields of sorghum and millet under a range of cultivars and traditional crop management practices. We applied the model to more than 7000 simulations of yields of sorghum and millet for 35 stations across West Africa and under very different future climate conditions. We took into account 35 possible climate scenarios by combining precipitation anomalies from -20% to 20% and temperature anomalies from C0 to C6 _C. We found that most of the 35 scenarios (31/35) showed a negative impact on yields, up to -41% for C6 _C = -20% rainfall. Moreover, the potential future climate impacts on yields are very different from those recorded in the recent past. This is because of the increasingly adverse role of higher temperatures in reducing crop yields, irrespective of rainfall changes. When warming exceeds C2 _C, negative impacts caused by temperature rise cannot be counteracted by any rainfall change. The probability of a yield reduction appears to be greater in the Sudanian region (southern Senegal, Mali, Burkina Faso, northern Togo and Benin), because of an exacerbated sensitivity to temperature changes compared to the Sahelian region (Niger, Mali, northern parts of Senegal and Burkina Faso), where crop yields are more sensitive to rainfall change. Finally, our simulations show that the photoperiod-sensitive traditional cultivars of millet and sorghum used by local farmers for centuries seem more resilient to future climate conditions than modern cultivars bred for their high yield potential (-28% versus -40% for the C4 _C = -20% scenario). Photoperiod-sensitive cultivars counteract the effect of temperature increase on shortening cultivar duration and thus would likely avoid the need to shift to cultivars with a greater thermal time requirement. However, given the large difference in mean yields

of the modern versus traditional varieties, the modern varieties would still yield more under optimal fertility conditions in a warmer world, even if they are more affected by climate change. (Résumé d'auteur)

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Articles publiés dans une revue à facteur d'impact

174

Lebot, V. (2013)

Strengthening smallholders' capacity to adapt to agro-climatic changes: Optimization of root crops germplasm management and use

Strengthening smallholders' capacity to adapt to agro-climatic changes: Optimization of root crops germplasm management and use

Journal of Root Crops vol.39:n°2

Since their domestication, root crops have been clonally distributed over wide geographical distances. The bottle necks induced by the introduction process often resulted in varieties with narrow genetic bases, now increasing smallholders' vulnerability to forthcoming agro-climatic changes. The question is: how can we develop adapted varieties, considering climatic uncertainties, the constraints in developing countries and the characteristics of the root crop species involved? These species share common biological traits: they are asexually propagated in farmers' fields, flowering ability of varieties is erratic, they have variable ploidy levels but are predominantly allogamous and highly heterozygous. Breeding is a slow process conducted on research stations even though it is widely accepted that G x E interactions are highly significant. The distribution of selected clones is then constrained by their low multiplication rate, the large number of smallholders, their geographical isolation, the absence of a 'seed' industry and strict international regulations. This paper presents a review of studies on root crops genetic diversity, their germplasm management systems and breeding constraints. It attempts to propose a new approach to strengthen smallholders' capacity to adapt to forthcoming changes. Suggestions are made for future research to address adaptation, taking into consideration improvement program needs at the national level. The geographical distribution of allelic diversity appears as a practical and cost-efficient approach. (Résumé d'auteur)

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Articles publiés dans une revue à comité de lecture, sans facteur d'impact

175

Lebot, V. (2013)

Coping with insularity: the need for crop genetic improvement to strengthen adaptation to climatic change and food security in the Pacific

Coping with insularity: the need for crop genetic improvement to strengthen adaptation to climatic change and food security in the Pacific

Environment, Development and Sustainability vol.15:n°6

The capability of Pacific Island countries' agriculture to adapt to climatic and environmental changes is analysed. After presenting key features of the region's food cropping systems, findings of genetic diversity studies for the most important food crops are reviewed and their implications for adaptation are discussed. Biophysical and economic vulnerabilities of the food system are identified. For the major food crops, the needs for genetic improvement are detailed, and practical solutions for broadening genetic bases are suggested. The paper concludes by identifying areas for additional research on crops and agro-ecosystems adaptation aiming at increasing the flexibility of agriculture in the Pacific. In this region, plant breeding has to cope with the insularity constraints of the small island states. The new varieties need to satisfy farmers' agronomic requirements in very diverse environments. However, because of genotype-by-environment interactions (G x E), it is difficult to identify a variety that would be accepted by most farmers on different islands. A new type of breeding programme with a pragmatic approach is therefore necessary. The geographical distribution of allelic diversity appears as a practical and cost-efficient solution. (Résumé d'auteur)

<http://dx.doi.org/10.1007/s10668-013-9445-1> Cirad-Agritrop Dk : 571239

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

176

Vom Brocke, K., Trouche, G., Weltzien, E., Kondombo-Barro, C. P., Sidibe, A., Zougmoré, R. B., and Gozé, E. (2014)

Helping farmers adapt to climate and cropping system change through increased access to sorghum genetic resources adapted to prevalent sorghum cropping systems in Burkina Faso

Helping farmers adapt to climate and cropping system change through increased access to sorghum genetic resources adapted to prevalent sorghum cropping systems in Burkina Faso
Experimental agriculture vol.50:n°2

Sorghum (*Sorghum bicolor* (L.) Moench) is a major staple crop of Burkina Faso where farmers continue to cultivate photoperiod-sensitive guinea landraces as part of the strategy to minimize risk and ensure yield stability. In the Boucle du Mouhoun region, however, sorghum farmers appear to have insufficient varietal choice due to cropping systems having shifted towards more intensive cultivation of cotton and maize, and rainfall patterns having decreased over the past decade. In search for new varietal options that can respond to this changing context, researchers decided to give farmers access to ex-situ national collections along with the opportunity to evaluate recent improved varieties. From 2002 to 2007, researchers and farmers worked closely together to implement on-farm testing, including varietal selection trials, crop management and multi-lokalional trials. Farmers' choices tend to differ among groups, villages and years, with the exception of four particular landraces: two originating from a collection carried out in the Mouhoun region more than 30 years previous to this research, and two other landraces that came from the dissimilar agro-ecological zones of Burkina Faso. These four were the most commonly selected landraces out of 36 cultivars that covered both improved and landrace varieties. Farmers' selection criteria were focused on adaptation to agro-climatic conditions as well as specific grain qualities for processing and consumption. The potential usefulness of each variety was verified via multi-lokalional trials. The paper also shows that wide dissemination of experimental seed, not just across the Mouhoun region but also at a national scale, was largely achieved through collaboration with a strong farmer organisation in conjunction with farmer training programs focused on the on-farm seed production and the commercialisation of this seed. (Résumé d'auteur)

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Articles publiés dans une revue à facteur d'impact

177

Roudier, P., Muller, B., D'Aquino, P., Roncoli, C., Batté, L., and Sultan, B. (2014)

The role of climate forecasts in smallholder agriculture: Lessons from participatory research in two communities in Senegal

The role of climate forecasts in smallholder agriculture: Lessons from participatory research in two communities in Senegal

Climate Risk Management vol.2

Climate forecasts have shown potential for improving resilience of African agriculture to climate shocks, but uncertainty remains about how farmers would use such information in crop management decisions and whether doing so would benefit them. This article presents results from participatory research with farmers from two agro-ecological zones of Senegal, West Africa. Based on simulation exercises, the introduction of seasonal and dekad forecasts induced changes in farmers' practices in almost 75% of the cases. Responses were categorized as either implying pure intensification of cropping systems (21% of cases), non-intensified strategies (31%) or a mix of both (24%). Among non-intensified strategies, the most common forecast uses are changes in sowing date and crop variety with the latter being more prevalent where a wider repertoire of varieties existed. Mixed strategies generally used more inputs like manure or chemical fertilizers coupled with another strategy such as changing sowing date. Yield estimates suggest that forecast use led to yield gains in about one-third of the cases, with relatively few losses. Impacts varied according to the nature of the actual rainy season, forecasts accuracy and the type of response, positive ones being higher in wetter years, with intensified strategies and with accurate predictions. These results validate prior evidence that climate forecasts may be able to help Senegalese farmers adapt to climate variability, especially helping them capitalize on anticipated favorable conditions. Realization of potential advantages appears associated with a context where there is greater varietal choice and options for intensification. (Résumé d'auteur)

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Articles publiés dans une revue à comité de lecture, sans facteur d'impact

178

Traoré, B. S., Van Wijk, M. T., Descheemaeker, K., Corbeels, M., Rufino, M. C., and Giller, K. E. (2014)

Evaluation of climate adaptation options for Sudano-Sahelian cropping systems

Evaluation of climate adaptation options for Sudano-Sahelian cropping systems

Field crops research vol.156

In the Sudano-Sahelian region, smallholder agricultural production is dominated by rain-fed production of millet, sorghum and maize for food consumption and of cotton for the market. A major constraint for crop production is the amount of rainfall and its intra and inter-annual variability. We evaluated the effects of planting date on the yield of different varieties of four major crops (maize, millet, sorghum and cotton) over three contrasting growing seasons in 2009-2011 (with 842 mm, 1248 mm and 685 mm of rainfall respectively) with the aim of identifying climate adaptation options in the Sudano-Sahelian region. Three planting dates (early, medium, and late) and three varieties of long, medium, and short duration of each crop were compared. For fertilized cereal crops, maize out yielded millet and sorghum by respectively 57% and 45% across the three seasons. Analysis of 40 years of weather data indicates that this finding holds for the longer time periods than the length of this trial. Late planting resulted in significant yield decreases for maize, sorghum and cotton, but not for millet. However, a short duration variety of millet was better adapted for late planting. When the rainy season starts late, sorghum planting can be delayed from the beginning of June to early July without substantial reductions in grain yield. Cotton yield at early planting was 28% larger than yield at medium planting and late planting gave the lowest yield with all three varieties. For all four crops the largest stover yields were obtained with early planting and the longer planting was delayed, the less stover was produced. There was an interaction between planting date and variety for millet and sorghum, while for maize and cotton the best planting date was more affected by the weather conditions. The findings of this study can support simple adaptation decisions: priority should be given to planting cotton early; maize is the best option if fertilizer is available; planting of maize and sorghum can be delayed by up to a month without strong yield penalties; and millet should be planted last. (Résumé d'auteur)

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Articles publiés dans une revue à facteur d'impact

179

Dorey, E., Fournier, P., Lechaudel, M., and Tixier, P. (2014)

Validity of the pineapple crop model SIMPIÑA across the climatic gradient in Réunion Island

Validity of the pineapple crop model SIMPIÑA across the climatic gradient in Réunion Island

European journal of agronomy vol.62

Models used for designing cropping systems and for responding to cropping problems caused by climate variations must generate accurate predictions. Here, we describe the SIMPIÑA model, which simulates the development and growth of the 'Queen Victoria' pineapple cultivar and which accounts for stress resulting from nitrogen and water deficiencies. We present the calibration and the validation of SIMPIÑA with 15 independent data sets derived from experiments carried out on Réunion Island and covering wider ranges of climatic conditions and management practices. Comparison of simulations with data sets shows that the predictive accuracy of SIMPIÑA is very good, with relative RMSE values ranging from 0.06 to 0.19 for plant fresh biomass; such precision is sufficient for informing management decisions. Interestingly, there was no bias between observed and simulated values. A process-removal approach allowed us to determine how stress processes resulting from water or nitrogen deficiency influence the predictive capacity of the model across a broad range of climatic conditions. There was no clear trend for the effect of climate on model error in comparisons of the model with stress processes removed. When stress processes were partially removed from the model, fruit biomass error was particularly high when the effect of stress was removed from the radiation conversion efficiency and from biomass remobilization. Given its ability to correctly predict crop dynamics under contrasting conditions, SIMPIÑA appears to include the essential processes at the correct level of complexity. (Résumé d'auteur)

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Articles publiés dans une revue à facteur d'impact

180

Allario, T., Brumos, J., Colmenero-Flores, J. M., Iglesias, D., Pina, J. A., Navarro, L., Talon, M., Ollitrault, P., and Morillon, R. (2013)

Tetraploid Rangpur lime rootstock increases drought tolerance via enhanced constitutive root abscisic acid production

Tetraploid Rangpur lime rootstock increases drought tolerance via enhanced constitutive root abscisic acid production

Plant, cell and environment vol.36:n°4

Whole-genome duplication, or polyploidy, is common in many plant species and often leads to better adaptation to adverse environmental conditions. However, little is known about the physiological and

molecular determinants underlying adaptation. We examined the drought tolerance in diploid (2x) and autotetraploid (4x) clones of Rangpur lime (*Citrus limonia*) rootstocks grafted with 2x Valencia Delta sweet orange (*Citrus sinensis*) scions, named V/2xRL and V/4xRL, respectively. Physiological experiments to study root-shoot communication associated with gene expression studies in roots and leaves were performed. V/4xRL was much more tolerant to water deficit than V/2xRL. Gene expression analysis in leaves and roots showed that more genes related to the response to water stress were differentially expressed in V/2xRL than in V/4xRL. Prior to the stress, when comparing V/4xRL to V/2xRL, V/4xRL leaves had lower stomatal conductance and greater abscisic acid (ABA) content. In roots, ABA content was higher in V/4xRL and was associated to a greater expression of drought responsive genes, including CsNCED1, a pivotal regulatory gene of ABA biosynthesis. We conclude that tetraploidy modifies the expression of genes in Rangpur lime citrus roots to regulate long-distance ABA signalling and adaptation to stress. (Résumé d'auteur)

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Articles publiés dans une revue à facteur d'impact

181

Soler, C., Saïdou, A.-A., Hamadou, T.-V., Pautasso, M., Wencelius, J., and Joly, H. (2013)

Correspondence between genetic structure and farmers' taxonomy - a case study from dry-season sorghum landraces in northern Cameroon

Correspondence between genetic structure and farmers' taxonomy - a case study from dry-season sorghum landraces in northern Cameroon

Plant genetic resources vol.11:n°1

The study of the genetic structure of cultivated plant populations maintained by farmers is of great importance for evolutionary and conservation biology. Such studies help understand the bases of crop evolution and conservation in relation to farmers' practices. In this study, we assessed the genetic structure underlying landrace diversity of dry-season sorghum. This crop constitutes a historical model of innovation developed by farmers to extend sorghum cultivation to the dry season. Two types of dry-season sorghum are cultivated. We aimed to assess the link between farmers' taxonomy and molecular genetic structure. We collected both types of dry-season sorghum in two villages of northern Cameroon which represented 20 landraces. These landraces were genotyped using eight polymorphic microsatellite markers. This study compared two clustering methods: a Bayesian method (STRUCTURE) which is based on explicit genetic assumptions and the discriminant analysis of principal component method. The latter, more recently proposed, is based on the combination of principal component analysis and discriminant analysis. We noticed a general congruence between these two methods. We also used both methods to infer the genetic structure of our sample. Our results showed strong genetic structuring of the landraces, with K 1/4 14 genetic clusters. We then analysed the fit between farmers' taxonomy and genetic structure. The data suggested that each type and each landrace corresponds to a given genetic entity. This pattern was robust across both villages, despite differences in cultural practices. (Résumé d'auteur)

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Articles publiés dans une revue à facteur d'impact

182

Ramarohetra, J., Sultan, B., Baron, C., Gaiser, T., and Gosset, M. (2013)

How satellite rainfall estimate errors may impact rainfed cereal yield simulation in West Africa

How satellite rainfall estimate errors may impact rainfed cereal yield simulation in West Africa

Agricultural and forest meteorology vol.180

Rainfall monitoring via satellite sensors is particularly relevant for the agricultural sector of West Africa. Indeed, food shortages in this region are often caused by rainfall deficits and an early access to data available for the entire region can help to provide credible and timely information for better decision making. This study assesses the accuracy of state-of-the-art satellite rainfall retrievals for agriculture applications in two sites in Niger and Benin. Although these satellite data are widely used instead of rain gauge data for such applications, we found that, in a crop-modelling framework, their use can introduce large biases in crop yield simulations. Biases differ strongly among the four cultivars considered in both sites and are not simple extrapolation of each satellite product cumulative rainfall amount biases. In particular, we found that if an accurate estimation of the annual cumulative rainfall amount is important for yield simulations of pearl millet 'Souna 3' and 'Somno' cultivars in Niger, a realistic distribution of rainfall is also very important for predicting pearl millet 'Somno' and 'HK' yields in Niger as well as maize yields in Benin. Overall the satellite products tested, 3B42v6 appears to be the most suitable satellite product for our specific agricultural application since it minimizes both

biases in rainfall distribution and in annual cumulative rainfall amount. For each crop and in both regions, biases in crop yield prediction are the highest when using non-calibrated satellite rainfall products (PERSIANN, 3B42RT, CMORPH and GSMAP). (Résumé d'auteur)
<http://dx.doi.org/10.1016/j.agrformet.2013.05.010> Cirad-Agritrop Dk : 569744
 Articles publiés dans une revue à facteur d'impact

183

Maoge, J., Ngamo Tinkeu, L., Michel, B., and Prost, A. (2014)

Spatial distribution of the pit builders antlion's larvae (Neuroptera: Myrmeleontidae) in the septentrional regions of Cameroon (Central Africa)

Spatial distribution of the pit builders antlion's larvae (Neuroptera: Myrmeleontidae) in the septentrional regions of Cameroon (Central Africa)

International journal of scientific and research publications vol.4:n°9

Antlions (Insecta: Neuroptera) are xerophilous insects adapt to arid conditions that perform some resilient behaviours to overcome some noxious effects of the global warming. This paper focuses on the determination of the diversity of the antlion in the Soudano-guinean and Soudano-sahelian area of Cameroon analyzes the distribution of antlion larvae in these regions. After 3 years of survey, 3 antlions species dominate in the North of Cameroon especially in the dry season. Pits distribution under four tropical trees species is irregular, there is higher density of pits close to the trunk at the shade. This decreases from the shade to open space. At the regional level, the antlion's pit site is influenced by the chemical composition of the soil: higher acidity, salinity, calcium and magnesium content are suppressive to larval development in one hand. In the other hand, potassium, sulfates and chloride amount are favorable to their development. *Myrmeleon quinquemaculatus* (Hagen, 1853), is endemic to Guinean higher savannah of the Adamaua region; *Myrmeleon obscurus* (Rambur, 1842) is a species widely spread in the 3 sampled regions, and *Hagenomyia tristicis* (Walker, 1853) is restricted to the Soudano-sahelian zone. (Résumé d'auteur)

<http://www.ijrsp.org/research-paper-0914/ijrsp-p3396.pdf> Cirad-Agritrop Dk : 574502

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

184

Virlet, N., Lebourgues, V., Martinez, S., Costes, E., Labbé, S., and Regnard, J.-L. (2014)

Stress indicators based on airborne thermal imagery for field phenotyping a heterogeneous tree population for response to water constraints

Stress indicators based on airborne thermal imagery for field phenotyping a heterogeneous tree population for response to water constraints

Journal of Experimental Botany vol.65:n°18

As field phenotyping of plant response to water constraints constitutes a bottleneck for breeding programmes, airborne thermal imagery can contribute to assessing the water status of a wide range of individuals simultaneously. However, the presence of mixed soil-plant pixels in heterogeneous plant cover complicates the interpretation of canopy temperature. Moran's Water Deficit Index (WDI = 1-ETact/ETmax), which was designed to overcome this difficulty, was compared with surface minus air temperature (Ts-Ta) as a water stress indicator. As parameterization of the theoretical equations for WDI computation is difficult, particularly when applied to genotypes with large architectural variability, a simplified procedure based on quantile regression was proposed to delineate the Vegetation Index-Temperature (VIT) scatterplot. The sensitivity of WDI to variations in wet and dry references was assessed by applying more or less stringent quantile levels. The different stress indicators tested on a series of airborne multispectral images (RGB, near-infrared, and thermal infrared) of a population of 122 apple hybrids, under two irrigation regimes, significantly discriminated the tree water statuses. For each acquisition date, the statistical method efficiently delineated the VIT scatterplot, while the limits obtained using the theoretical approach overlapped it, leading to inconsistent WDI values. Once water constraint was established, the different stress indicators were linearly correlated to the stem water potential among a tree subset. Ts-Ta showed a strong sensitivity to evaporative demand, which limited its relevancy for temporal comparisons. Finally, the statistical approach of WDI appeared the most suitable for high-throughput phenotyping. (Résumé d'auteur)

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Articles publiés dans une revue à facteur d'impact

185

Gheewala, S. H., Silalertruksa, T., Nilsalab, P., Mungkung, R., Perret, S., and Chaiyawannakarn, N. (2014)

Water footprint and impact of water consumption for food, feed, fuel crops production in Thailand

Water footprint and impact of water consumption for food, feed, fuel crops production in Thailand

Water vol.6:n°6

The proliferation of food, feed and biofuels demands promises to increase pressure on water competition and stress, particularly for Thailand, which has a large agricultural base. This study assesses the water footprint of ten staple crops grown in different regions across the country and evaluates the impact of crop water use in different regions/watersheds by the water stress index and the indication of water deprivation potential. The ten crops include major rice, second rice, maize, soybean, mungbean, peanut, cassava, sugarcane, pineapple and oil palm. The water stress index of the 25 major watersheds in Thailand has been evaluated. The results show that there are high variations of crop water requirements grown in different regions due to many factors. However, based on the current cropping systems, the Northeastern region has the highest water requirement for both green water (or rain water) and blue water (or irrigation water). Rice (paddy) farming requires the highest amount of irrigation water, i.e., around 10,489 million m³/year followed by the maize, sugarcane, oil palm and cassava. Major rice cultivation induces the highest water deprivation, i.e., 1862 million m³H₂Oeq/year; followed by sugarcane, second rice and cassava. The watersheds that have high risk on water competition due to increase in production of the ten crops considered are the Mun, Chi and Chao Phraya watersheds. The main contribution is from the second rice cultivation. Recommendations have been proposed for sustainable crops production in the future. (Résumé d'auteur)

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Articles publiés dans une revue à facteur d'impact

186

Pallas, B., Clément-Vidal, A., Rebolledo, M. C., Soulle, J.-C., and Luquet, D. (2013)

Using plant growth modeling to analyse C source-sink relations under drought: inter and intra specific comparison

Using plant growth modeling to analyse C source-sink relations under drought: inter and intra specific comparison

Frontiers in Plant Science vol.4:n°437

The ability to assimilate C and allocate non-structural carbohydrates (NSCs) to the most appropriate organs is crucial to maximize plant ecological or agronomic performance. Such C source and sink activities are differentially affected by environmental constraints. Under drought, plant growth is generally more sink than source limited as organ expansion or appearance rate is earlier and stronger affected than C assimilation. This favors plant survival and recovery but not always agronomic performance as NSC are stored rather than used for growth due to a modified metabolism in source and sink leaves. Such interactions between plant C and water balance are complex and plant modeling can help analyzing their impact on plant phenotype. This paper addresses the impact of trade-offs between C sink and source activities and plant production under drought, combining experimental and modeling approaches. Two contrasted monocotyledonous species (rice, oil palm) were studied. Experimentally, the sink limitation of plant growth under moderate drought was confirmed as well as the modifications in NSC metabolism in source and sink organs. Under severe stress, when C source became limiting, plant NSC concentration decreased. Two plant models dedicated to oil palm and rice morphogenesis were used to perform a sensitivity analysis and further explore how to optimize C sink and source drought sensitivity to maximize plant growth. Modeling results highlighted that optimal drought sensitivity depends both on drought type and species and that modeling is a great opportunity to analyze such complex processes. Further modeling needs and more generally the challenge of using models to support complex trait breeding are discussed. (Résumé d'auteur)

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Articles publiés dans une revue à facteur d'impact

187

Soler, A., Marie Alphonsine, P.-A., Corbion, C., Fernandes, P., Portal González, N., Gonzalez, R., Repellin, A., Declerck, S., and Quénéhervé, P. (2013)

A strategy towards bioprotection of tropical crops: Experiences and perspectives

A strategy towards bioprotection of tropical crops: Experiences and perspectives

IOBC/WPRS bulletin vol.89 2013-06-10/2013-06-13

Tropical crop infestation by soil borne parasites (pineapple : *Rotylenchulus reniformis* and banana : *Pratylenchus coffea* e) cannot be controlled anymore by pesticides in French Antilles under the new European regulations . Therefore, we investigated the possible contribution of induced systemic resistances (ISR) to biocontrol pests and to develop more environmentally friendly agrosystems. In Martinique (Campus Agro - environnemental Caraïbe), we are presently testing a strategy based on current knowledge on ISR through interaction between plants and beneficial microorganisms. The investigations are based on four main hypotheses: 1) The inoculum of soil borne parasites can be reduced introducing non - host rotation plants. Cover crops were selected on the basis of several functional traits (non - host status, high biomass), for their contribution to a balanced microfauna in the rhizosphere, and for their positive effect on soil mycorrhization potential. 2) The selection of pineapple and banana varieties able to develop ISR AND adapt their metabolism to environmental changes is essential. We found differential responses against nematodes to an ISR inducer (methyljasmonate, 10 - 4 M) in several pineapple and banana varieties and we are now searching for a relation with markers of plant adaptability to environmental changes (genes for cysteine - proteases and their inhibitors phyto - cystatins). 3) The successful development of ISR responses is dependent on the capacity of a plant to tolerate abiotic stresses (drought, temperature, salinity...) in addition to the pathogens. As ISR may also be part of the global adaptability of plant metabolism to tolerate abiotic stresses from their habitat, we investigate the possible links between stress level and a plant's capacity to induce efficient ISR against soil - borne parasites (ongoing). 4) Pineapple and banana root systems bear diazotrophic bacteria (endophytic) that can be used as ISR inducers in the field. Seventy - five and ninety - one diazotrophic bacteria strains (endophytic) respectively for pineapple and banana were isolated from their root systems in different sites in Martinique including organic and intensive cropping systems. They are currently being identified (MIDI - FAME and ADNr16S sequencing) and tested as ISR inducers. Our research aims at validating the hypothesis that efficient and consistent systemic resistances to pathogens can be achieved in the field by using selected varieties tolerant to abiotic stresses. (Résumé d'auteur)

http://www.iobc-wprs.org/pub/bulletins/bulletin_2013_89_table_of_contents_abstracts.pdf Cirad-Agritrop Dk : 569834

Articles publiés dans une revue sans comité de lecture

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Scopel, E., Triomphe, B., Affholder, F., Macena Da Silva, F.-A., Corbeels, M., Valadares Xavier, J. H., Lahmar, R., Recous, S., Bernoux, M., Blanchart, E., De Carvalho Mendes, L., and De Tourdonnet, S. (2013)

Conservation agriculture cropping systems in temperate and tropical conditions, performances and impacts. A review

Conservation agriculture cropping systems in temperate and tropical conditions, performances and impacts. A review

Agronomy for sustainable development vol.33:n°1

Nowadays, in a context of climate change, economical uncertainties and social pressure to mitigate agriculture externalities, farmers have to adopt new cropping systems to achieve a sustainable and cost-effective grain production. Conservation agriculture consists of a range of cropping systems based on a combination of three main principles: (1) soil tillage reduction, (2) soil protection by organic residues and (3) diversification in crop rotation. Conservation agriculture has been promoted as a way to reduce production costs, soil erosion and soil fertility degradation under both tropical and temperate conditions. Conservation agriculture-based cropping systems have diffused widely under Brazilian large-scale farms' conditions and more recently in Europe in the context of medium-size mechanized farms. Their diffusion, however, is still limited under small-scale non-mechanized farms' conditions of tropical countries. To assess the advantages and limits of such new cropping systems, this article compares experiences with conservation agriculture from the tropical Cerrado region of Brazil and from temperate conditions of Europe. It focusses on agronomic performances, environmental impacts and economical results. Conservation agriculture systems appear to be interesting options to achieve sustainable and intensive crop production under different agroecological environments because they use efficiently available resources and maintain soil fertility. However, this mostly results from the permanent presence of an organic mulch on the soil surface and the incorporation of cover crops in the rotations. Such modifications require a significant reorganization of the production process at farm level, and when facing technical or socioeconomic constraints, most farmers usually opt for applying only partially the three main principles of conservation agriculture. Investigating more fully the consequences of such partial implementation of conservation agriculture principles on its actual efficiency and assessing the most efficient participatory approaches needed to adapt conservation

agriculture principles to local conditions and farming systems are top priorities for future research.

(Résumé d'auteur)

<http://dx.doi.org/10.1007/s13593-012-0106-9> Cirad-Agritrop Dk : 566936

Articles publiés dans une revue à facteur d'impact

189

Perrin, A., Basset-Mens, C., and Gabrielle, B. (2014)

Life cycle assessment of vegetable products: a review focusing on cropping systems diversity and the estimation of field emissions

Life cycle assessment of vegetable products: a review focusing on cropping systems diversity and the estimation of field emissions

International journal of life cycle assessment vol.19:n°6

Purpose Recent life cycle assessment studies for vegetable products have identified the agricultural stage as one of the most important contributors to the environmental impacts for these products, while vegetable production systems are characterized by specific but also widely diverse production conditions. In this context, a review aiming at comparing the potential impacts of vegetable products and analyzing the relevance of the methods and data used for the inventory of the farm stage appeared necessary. Methods Ten papers published in peer-reviewed scientific journals or ISO-compliant reports were selected. First, a presentation of the selected papers was done to compare the goal and scope and the life cycle inventory data to the related sections in the ILCDHandbook. Second, a quantitative review of input flows and life cycle impact assessment (LCIA) results (global warming, eutrophication, and acidification) was based on a cropping system typology and on a classification per product group. Third, an in-depth analysis of the methods used to estimate field emissions of reactive nitrogen was proposed. Results and discussion The heated greenhouse system types showed the greatest global warming potential. The giant bean group showed the greatest acidification and eutrophication potentials per kilogram of product, while the tomato group showed the greatest acidification and eutrophication potentials per unit of area. Main sources of variations for impacts across systems were yields and inputs variations and system expansion rules. Overall, the ability to compare the environmental impact for these diverse vegetable products from cradle-toharvest was hampered by (1) weaknesses regarding transparency of goal and scope, (2) a lack of representativeness and completeness of data used for the field stage, and (3) heterogeneous and inadequate methods for estimating field emissions. In particular, methods to estimate reactive nitrogen emissions were applied beyond their validity domain. Conclusions and recommendations This first attempt at comparing the potential impacts of vegetable products pinpointed several gaps in terms of data and methods to reach representative LCIA results for the field production stage. To better account for the specificities of vegetable cropping systems and improve the overall quality of their LCA studies, our key recommendations were (1) to include systematically phosphorus, water, and pesticide fluxes and characterize associated impacts, such as eutrophication, toxicity, and water deprivation; (2) to better address space and time representativeness for field stage inventory data through better sampling procedures and reporting transparency; and (3) to use best available methods and when possible more mechanistic tools for estimating Nr emissions. (Résumé d'auteur)

<http://dx.doi.org/10.1007/s11367-014-0724-3> Cirad-Agritrop Dk : 573499

Articles publiés dans une revue à facteur d'impact

190

Hainzelin, E.-É. s. (2013)

Cultivating biodiversity to transform agriculture, Springer [Allemagne], Heidelberg. XIV-261 p.

Présentation de l'éditeur : Agriculture is the primary human activity: it involves 1.3 billion people, nearly a quarter of the world's population and half of its labour force. The cultivated area, i.e., the area where humans plan and directly control the vegetation cover, now represents over 20% of the landmass. Faced with the challenges of demography and poverty, agricultural systems, in all their diversity, are being called upon to intensify and enhance the production of goods and services. At the same time, they are expected to be able to cope better with climatic and other risks and uncertainties. How can biodiversity contribute to the transformation of these agricultural systems? The diversity of living organisms has served agriculture since its origins in the Neolithic Era. But modern farming has aimed for ever increasing and consistent yields, relying on massive use of synthetic inputs and fossil energy to do so. Indeed, we seem to have forgotten how much plant, animal and microbial biodiversity are the engine of all production processes and the basis for the regulation of ecosystems, both cultivated and natural. We will have to understand biodiversity better, remobilize it, enrich it and plan it - in one word cultivate it - in order to intensify production in a sustainable manner and ensure global food security.

This will put agriculture in the developing world at the centre of discussions on possible transformations of agricultural systems. This book approaches these issues from various angles and shows how these transformations are not limited to the plot and its crop but also concern the profound links between rural communities and their living heritage, their ways to conserve this agrobiodiversity and their innovative ways for benefitting from it. Contents: 1. Introduction (Étienne Hainzelin). 2. The diversity of living organisms: the engine for ecological functioning (Étienne Hainzelin, Christine Nouaille). 3. From artificialization to the ecologization of cropping systems (Florent Maraix, Éric Malézieux, Christian Gary). 4. Rethinking plant breeding (Nourollah Ahmadi, Benoît Bertrand, Jean-Christophe Glaszmann). 5. Ecological interactions within the biodiversity of cultivated systems (Alain Ratnadass, Éric Blanchart, Philippe Lecomte). 6. Conserving and cultivating agricultural genetic diversity: transcending established divides (Sélim Louafi, Didier Bazile, Jean-Louis Noyer). 7. Towards biodiverse agricultural systems: reflecting on the technological, social and institutional changes at stake (Estelle Biénabe)

<http://dx.doi.org/10.1007/978-94-007-7984-6> Cirad-Agritrop : CD_F08 HAI 16740; CD_F08 HAI 16762; BA_F01 HAI 5814 Dk : 571811

191

Dingkuhn, M., Gérardeaux, E., Gate, P., and Legave, J. M. (2013)

Les productions végétales. In "S'adapter au changement climatique : agriculture, écosystèmes et territoires. - Versailles : Ed. Quae, 2013", pp. 91-106.

Cirad-Agritrop : CD_P40 SOU 16668; BA_P40 SOU 5747 Dk : 570827

192

Costa Junior, C., Corbeels, M., Bernoux, M., Piccolo, M. d. C., Neto, M. S., Feigl, B. E., Cerri, C. E. P., Cerri, C. C., Scopel, E., and Lal, R. (2013)

Assessing soil carbon storage rates under no-tillage: Comparing the synchronic and diachronic approaches

Assessing soil carbon storage rates under no-tillage: Comparing the synchronic and diachronic approaches

Soil and tillage research vol.134

No-tillage (NT) practices with crop residue mulching are seen as an effective way to accumulate soil carbon (C). The rate of soil C accumulation can be determined by measuring soil C stocks over time (diachronic approach) or along a chronosequence that substitutes spatial history differences for time differences (synchronic approach). The objective of this communication is to compare the diachronic and synchronic approaches for determining the rates of soil C storage under NT in the Cerrado region of Brazil. In 2003 and 2007, soil C stocks (0-20 cm) were determined in three NT fields with 5, 9 and 17 years of NT adoption in 2007 (NT-5, NT-9 and NT-17, respectively), one conventionally tilled field (CT, 30 years of tillage in 2007) and one native Cerrado plot (CE) in Rio Verde (Goia's state, Brazil). Soil C accumulation rates were calculated following both the synchronic and diachronic approach. Results from the synchronic approach showed that 30 years of cropping under CT depleted the soil C stock to 34.4 Mg C ha⁻¹, which is a decrease of about 27% of the original levels observed under the native vegetation (CE, 47.1 and 47.3 Mg C ha⁻¹, respectively, in 2003 and 2007). Instead, NT adoption had been accumulating soil C through the evaluated years. Soil C stocks measured under NT areas in 2003 and 2007 were 29.9 and 31.3 Mg C ha⁻¹ (NT-5), 33.4 and 34.4 Mg C ha⁻¹ (NT-9) and 45.8 and 46.4 Mg C ha⁻¹ (NT-17), respectively. Much more moderate rates of soil C accumulation were observed diachronically (0.12-0.28 Mg C ha⁻¹ year⁻¹) than with the synchronic approach (1.33 and 1.27 Mg C ha⁻¹ year⁻¹ in 2003 and 2007, respectively). Soil C stocks under CE between 2003 and 2007 (in the diachronic approach) did not change, indicating that diachronic measurements were accurate. Thus, it appears to be very difficult to eliminate all non-wanted sources of soil C variation (i.e. soil texture, land-use history) analysing the soil C accumulation in a chronosequence (synchronic approach). In spite of a time span of years between sampling dates, our results suggest the need for using the diachronic approach when assessing soil C changes under altering land-use or management patterns. Increasing the number of diachronic assessments may also help the parameterization of process-oriented models for exploring the effects of no-tillage systems on soil C storage rates more accurately. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.still.2013.08.010> Cirad-Agritrop Dk : 570639

Articles publiés dans une revue à facteur d'impact

193

Bessou, C., Lehuger, S., Gabrielle, B., and Mary, B. (2013)

Using a crop model to account for the effects of local factors on the LCA of sugar beet ethanol in Picardy region, France

Using a crop model to account for the effects of local factors on the LCA of sugar beet ethanol in Picardy region, France

International journal of life cycle assessment vol.18:n°1

Purpose The results of published Life Cycle Assessments (LCAs) of biofuels are characterized by a large variability, arising from the diversity of both biofuel chains and the methodologies used to estimate inventory data. Here, we suggest that the best option to maximize the accuracy of biofuel LCA is to produce local results taking into account the local soil, climatic and agricultural management factors. Methods We focused on a case study involving the production of first-generation ethanol from sugar beet in the Picardy region in Northern France. To account for local factors, we first defined three climatic patterns according to rainfall from a 20-year series of weather data. We subsequently defined two crop rotations with sugar beet as a break crop, corresponding to current practice and an optimized management scenario, respectively. The six combinations of climate types and rotations were run with the process-based model CERES-EGC to estimate crop yields and environmental emissions. We completed the data inventory and compiled the impact assessments using Simapro v.7.1 and Ecoinvent database v2.0. Results Overall, sugar beet ethanol had lower impacts than gasoline for the abiotic depletion, globalwarming, ozone layer depletion and photochemical oxidation categories. In particular, it emitted between 28 % and 42 % less greenhouse gases than gasoline. Conversely, sugar beet ethanol had higher impacts than gasoline for acidification and eutrophication due to losses of reactive nitrogen in the arable field. Thus, LCA results were highly sensitive to changes in local conditions and management factors. As a result, an average impact figures for a given biofuel chain at regional or national scales may only be indicative within a large uncertainty band. Conclusions Although the crop model made it possible to take local factors into account in the life-cycle inventory, best management practices that achieved high yields while reducing environmental impacts could not be identified. Further modelling developments are necessary to better account for the effects of management practices, in particular regarding the benefits of fertiliser incorporation into the topsoil in terms of nitrogen losses abatement. Supplementary data and modelling developments also are needed to better estimate the emissions of pesticides and heavy metals in the field. (Résumé d'auteur)

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Articles publiés dans une revue à facteur d'impact

194

Pautasso, M., Aistara, G., Barnaud, A., Caillon, S., Clouvel, P., Coomes, O. T., Delêtre, M., Demeulenaere, E., De Santis, P., Döring, T., Eloy, L., Emperaire, L., Garine, E., Goldringer, I., Jarvis, D., Joly, H., Leclerc, C., Louafi, S., Martin, P., Massol, F., McGuire, S., McKey, D. B., Padoch, C., Soler, C., Thomas, M., and Tramontini, S. (2013)

Seed exchange networks for agrobiodiversity conservation. A review

Seed exchange networks for agrobiodiversity conservation. A review

Agronomy for sustainable development vol.33:n°1

The circulation of seed among farmers is central to agrobiodiversity conservation and dynamics. Agrobiodiversity, the diversity of agricultural systems from genes to varieties and crop species, from farming methods to landscape composition, is part of humanity's cultural heritage. Whereas agrobiodiversity conservation has received much attention from researchers and policy makers over the last decades, the methods available to study the role of seed exchange networks in preserving crop biodiversity have only recently begun to be considered. In this overview, we present key concepts, methods, and challenges to better understand seed exchange networks so as to improve the chances that traditional crop varieties (landraces) will be preserved and used sustainably around the world. The available literature suggests that there is insufficient knowledge about the social, cultural, and methodological dimensions of environmental change, including how seed exchange networks will cope with changes in climates, socio-economic factors, and family structures that have supported seed exchange systems to date. Methods available to study the role of seed exchange networks in the preservation and adaptation of crop specific and genetic diversity range from meta-analysis to modelling, from participatory approaches to the development of bio-indicators, from genetic to biogeographical studies, from anthropological and ethnographic research to the use of network theory. We advocate a diversity of approaches, so as to foster the creation of robust and policy-relevant knowledge. Open challenges in the study of the role of seed exchange networks in biodiversity conservation include the development of methods to (i) enhance farmers' participation to decision-making in agro-ecosystems, (ii) integrate ex situ and in situ approaches, (iii) achieve interdisciplinary research collaboration between social and natural scientists, and (iv) use network

analysis as a conceptual framework to bridge boundaries among researchers, farmers and policy makers, as well as other stakeholders. (Résumé d'auteur)
<http://dx.doi.org/10.1007/s13593-012-0089-6> Cirad-Agritrop Dk : 566814
Articles publiés dans une revue à facteur d'impact

195

Chotte, J.-L., Bernoux, M., Valentin, C., Dugué, P., Faure, G., and Lifran, R. (2014)

Le Programme Rime-PAMPA : des SCV à l'agroécologie

Le Programme Rime-PAMPA : des SCV à l'agroécologie

Grain de sel n°63-66

Cirad-Agritrop Dk : 574337

Articles publiés dans une revue sans comité de lecture

196

Brévault, T., and Bouyer, J. (2014)

From integrated to system-wide pest management: Challenges for sustainable agriculture

From integrated to system-wide pest management: Challenges for sustainable agriculture

Outlooks on Pest Management vol.25:n°3

Insect pests and vectors of animal and plant diseases are a major constraint to the improvement of agricultural productivity, and a continuous threat to food security and livelihoods, particularly in less developed countries. The excessive reliance on broad-spectrum insecticides as the prevailing strategy to control pest outbreaks for over 50 years worldwide has showed some limitations with the increasing number of documented cases of field-evolved resistance and re-emergence of pests or vector-borne diseases that had been previously placed under control. More widely, agriculture intensification has contributed to the erosion of crop and livestock genetic diversity and fragmentation or suppression of natural habitats supporting biodiversity-mediated ecosystem services such as insect pest regulation. These concerns are being exacerbated in a context of global change, including population growth, global warming, transboundary trade, on-farm loss of biodiversity, and societal demand for a safer environment and residue-free food, which foster increasingly stringent pesticide use in agriculture and livestock farming. Integrated pest management (IPM) is an ecosystem approach to crop production and protection that combines different management strategies and practices to grow healthy crops and minimize the use of pesticides. IPM thus requires science-based knowledge of the life cycle of pests and their interactions with the environment, including natural enemies and habitats. Field realities, however, show that IPM is often used in a reactive manner and at a local scale, as a simple toolbox. A fundamental shift to a system-wide approach is needed to achieve preventive and effective pest control, while enhancing crop yields, and reducing farmers' reliance on pesticide use and the associated environmental impacts. This shift should at least consider: (i) the functional area of the target pest populations; (ii) the complexity of ecological processes driving regulation; and (iii) the intelligent combination of pest control technologies. Area-wide integrated pest management is a promising way to improve conventional pest control by targeting pest populations within their functional area. This approach requires a better knowledge of target pests, especially regarding their life system (spatial distribution, habitats, dispersal ability over time and space, genetic structure, metapopulation dynamics and gene flow), ecological processes driving regulation (food web networks and natural enemy assemblages), and responses to farming practices at a field and landscape scale. In addition, the success of such an approach relies on a strong cooperation amongst stakeholders for the design, implementation and compliance of pest management programs, and requires farmer education and external coordination, either from governmental bodies or farmers associations. (Résumé d'auteur)

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Articles publiés dans une revue sans comité de lecture

197

Halewood, M.-É. s., López Noriega, I.-É. s., and Louafi, S.-É. s. (2013)

Crop genetic resources as a global commons: Challenges in international law and governance,
Earthscan Publications, Londres. XVI-399 p.

Présentation de l'éditeur : Farmers have engaged in collective systems of conservation and innovation - improving crops and sharing their reproductive materials - since the earliest plant domestications. Relatively open flows of plant germplasm attended the early spread of agriculture; they continued in the wake of (and were driven by) imperialism, colonization, emigration, trade, development assistance and climate change. As crops have moved around the world, and agricultural innovation and

production systems have expanded, so too has the scope and coverage of pools of shared plant genetic resources that support those systems. The range of actors involved in their conservation and use has also increased dramatically. This book addresses how the collective pooling and management of shared plant genetic resources for food and agriculture can be supported through laws regulating access to genetic resources and the sharing of benefits arising from their use. Since the most important recent development in the field has been the creation of the multilateral system of access and benefit-sharing under the International Treaty on Plant Genetic Resources for Food and Agriculture, many of the chapters in this book will focus on the architecture and functioning of that system. The book analyzes tensions that are threatening to undermine the potential of access and benefit-sharing laws to support the collective pooling of plant genetic resources, and identifies opportunities to address those tensions in ways that could increase the scope, utility and sustainability of the global crop commons. Contents: 1. The global crop commons and access and benefit-sharing laws: examining the limits of policy support for the collective pooling and management of plant genetic resources (Michael Halewood, Isabel López Noriega, Selim Louafi). Part 1: Setting the scene: countries' interdependence on plant genetic resources for food and agriculture and the imperative of international cooperation. 2. Demonstrating interdependence on plant genetic resources for food and agriculture. 3. Flows of crop germplasm into and out of China. 4. Crop and forage genetic resources: international interdependence in the face of climate change. 5. Changing rates of acquisition of plant genetic resources by international gene banks: setting the scene to monitor an impact of the International Treaty. Part 2: The history and design of the International Treaty's multilateral system of access and benefit-sharing. 6. Brief history of the negotiations of the International Treaty on Plant Genetic Resources for Food and Agriculture. 7. The design and mechanics of the multilateral system of access and benefit sharing. 8. Protecting the interests of the multilateral system under the Standard Material Transfer Agreement: the third party beneficiary. 9. Plant genetic resources under the management and control of the contracting parties and in the public domain: how rich is the ITPGRFA's multilateral system?. 10. Efforts to get the multilateral system up and running: a review of activities coordinated by the Treaty's Secretariat (Selim Louafi, Shakeel Bhatti). Part 3: Critical reflections. 11. Assessment of progress to make the multilateral system functional: incentives and challenges at the country level. 12. From negotiations to implementation: global review of achievements, bottlenecks and opportunities for the Treaty in general, and the multilateral system in particular. 13. The multilateral system of access and benefit-sharing: could it have been constructed another way?. 14. The moving scope of Annex 1: the list of crops covered under the multilateral system; 15. Building a global information system in support of the International Treaty on Plant Genetic Resources for Food and Agriculture (Caroline Ker, Myriam Sanou, Selim Louafi). 16. Collective action challenges in the implementation of the multilateral system of the International Treaty: what roles for the CGIAR centres? (Selim Louafi). 17. International and regional cooperation in the implementation of the International Treaty on Plant Genetic Resources for Food and Agriculture. 18. The evolving global system of conservation and use of plant genetic resources for food and agriculture: what is it, and where does the Treaty fit it?. 19. Institutionalizing global genetic resource commons for food and agriculture

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198

Vintrou, E., Bégué, A., Baron, C., Saad, A., Lo Seen, D., and Traoré, S. B. (2014)

A comparative study on satellite- and model-based crop phenology in West Africa

A comparative study on satellite- and model-based crop phenology in West Africa

Remote sensing vol.6:n°2

Crop phenology is essential for evaluating crop production in the food insecure regions of West Africa. The aim of the paper is to study whether satellite observation of plant phenology are consistent with ground knowledge of crop cycles as expressed in agro-simulations. We used phenological variables from a MODIS Land Cover Dynamics (MCD12Q2) product and examined whether they reproduced the spatio-temporal variability of crop phenological stages in Southern Mali. Furthermore, a validated cereal crop growth model for this region, SARRA-H (System for Regional Analysis of Agro-Climatic Risks), provided precise agronomic information. Remotely-sensed green-up, maturity, senescence and dormancy MODIS dates were extracted for areas previously identified as crops and were compared with simulated leaf area indices (LAI) temporal profiles generated using the SARRA-H crop model, which considered the main cropping practices. We studied both spatial (eight sites throughout South Mali during 2007) and temporal (two sites from 2002 to 2008) differences between simulated crop cycles and determined how the differences were indicated in satellite-derived phenometrics. The spatial comparison of the phenological indicator observations and simulations showed mainly that (i)

the satellite-derived start-of-season (SOS) was detected approximately 30 days before the model-derived SOS; and (ii) the satellite-derived end-of-season (EOS) was typically detected 40 days after the model-derived EOS. Studying the inter-annual difference, we verified that the mean bias was globally consistent for different climatic conditions. Therefore, the land cover dynamics derived from the MODIS time series can reproduce the spatial and temporal variability of different start-of-season and end-of-season crop species. In particular, we recommend simultaneously using start-of-season phenometrics with crop models for yield forecasting to complement commonly used climate data and provide a better estimate of vegetation phenological changes that integrate rainfall variability, land cover diversity, and the main farmer practices. (Résumé d'auteur)

<http://dx.doi.org/10.3390/rs6021367> Cirad-Agritrop Dk : 573921

Articles publiés dans une revue à facteur d'impact

199

Muleke, E., Saidi, M., Itulya, F. M., Martin, T., and Ngouajio, M. (2014)

Enhancing cabbage (#Brassica oleraceae Var capitata#) yields and quality through microclimate modification and physiological improvement using agronet covers

Enhancing cabbage (#Brassica oleraceae Var capitata#) yields and quality through microclimate modification and physiological improvement using agronet covers

Sustainable Agriculture Research vol.3:n°2

Adverse environmental conditions have contributed to perpetual poor cabbage (*Brassica oleraceae* var. *capitata*) yields in sub-Saharan Africa. Elsewhere, net covers have been reported to provide a low-cost technology with the potential of modifying the microclimate around a crop for better performance. Two experiments were therefore conducted over a span of two seasons to determine the effects of agronet covers on microclimate modification and subsequent cabbage yield and quality. The treatments comprised cabbage plants grown under either fine mesh (0.4 mm pore diameter) or large mesh (0.9 mm pore diameter) agronet covers maintained permanently closed, or opened thrice weekly from 9 am to 3 pm and a control treatment where cabbage was grown in the open field. Net covering generally modified the microclimate by raising temperatures, relative humidity and volumetric water content but lowering photosynthetic active radiation and diurnal temperature range compared to control. The use of agronet covers resulted in better cabbage performance. The large mesh (0.9 mm) enhanced leaf stomatal conductance and chlorophyll content, and improved fresh and dry weight as well as head quality. Results of this study present the use of agronet covers as a potentially effective technology for use by small-scale farmers in protected cabbage culture in sub-Saharan Africa. (Résumé d'auteur)

<http://dx.doi.org/10.5539/sar.v3n2p24> Cirad-Agritrop Dk : 573376

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

200

Gogo, E. O., Saidi, M., Ochieng, J. M., Martin, T., Baird, V., and Ngouajio, M. (2014)

Microclimate modification and insect pest exclusion using agronet improve pod yield and quality of french bean

Microclimate modification and insect pest exclusion using agronet improve pod yield and quality of french bean

HortScience vol.49:n°10

French bean [*Phaseolus vulgaris* (L.)] is among the leading export vegetable in Africa, mostly produced by small-scale farmers. Unfavorable environmental conditions and heavy infestations by insect pests are among the major constraints limiting production of the crop. Most French bean producers grow their crop in open fields outdoors subject to harsh environmental conditions and repeatedly spray insecticides in a bid to realize high yield. This has led to rejection of some of the produce at the export market as a result of stringent limits on maximum residue levels. Two trials were conducted at the Horticulture Research and Teaching Field, Egerton University, Kenya, to evaluate the potential of using agricultural nets (herein referred to as agronets) to improve the microclimate, reduce pest infestation, and increase the yield and quality of French bean. A randomized complete block design with five replications was used. French bean seeds were direct-seeded, sprayed with an alpha-cypermethrin-based insecticide (control), covered with a treated agronet (0.9 mm 3 0.7 mm average pore size made of 100 denier yarn knitted into a mesh impregnated with alpha-cypermethrin), or covered with an untreated-agronet (0.9 mm 3 0.7 mm average pore size made of 100 denier yarn knitted into a mesh not impregnated with insecticide). Alpha-cypermethrin and agronets were manufactured by Tagros Chemicals (India) and A to Z Textile Mills (Tanzania), respectively. Covering French bean with the agronets modified the microclimate of the growing crop with air temperature

increased by '10%, relative humidity by 4%, and soil moisture by 20%, whereas photosynthetic active radiation (PAR) and daily light integral (DLI) were decreased by '1% and 11.5%, respectively. Populations of silverleaf whitefly [*Bemisia tabaci* (Gennadius)] and black bean aphids [*Aphis fabae* (Scopoli)] were reduced under agronet covers as contrasted with control plots. Furthermore, populations of both pests were reduced on French bean grown under impregnated agronets compared with untreated agronets, but only on three of the five sampling dates [30, 44, and 72 days after planting (DAP)] for silver leaf whitefly or at only one of the five sampling dates (30 DAP) for black bean aphid. Covering French bean with agronets advanced seedling emergence by 2 days and increased seedling emergence over 90% compared with control plots. French bean plants covered with both agronet treatments had faster development, better pod yield, and quality compared with the uncovered plants. These findings demonstrate the potential of agronets in improving French bean performance while minimizing the number of insecticide sprays within the crop cycle, which could lead to less rejection of produce in the export market and improved environmental quality. (Résumé d'auteur)

Cirad-Agritrop Dk : 574420

Articles publiés dans une revue à facteur d'impact

201

Saidi, M., Gogo, E. O., Itulya, F. M., Martin, T., and Ngouajio, M. (2013)

Microclimate modification using eco-friendly nets and floating row covers improves tomato (*Lycopersicon esculentum*) yield and quality for small holder farmers in East Africa

Microclimate modification using eco-friendly nets and floating row covers improves tomato (*Lycopersicon esculentum*) yield and quality for small holder farmers in East Africa

Agricultural Sciences vol.4:n°11

Tomato (*Lycopersicon esculentum*) is one of the important vegetables in supplying vitamins, minerals and fiber to human diets worldwide. Its successful production in the tropics is, however, constrained by environmental variations especially under open field conditions. Two trials were conducted at the Horticulture Research and Teaching Field, Egerton University, Kenya to evaluate the effects of agricultural nets (agronets) herein called eco-friendly nets (EFNs) and floating row covers (FRCs) on microclimate modification, yield, and quality of tomato. A randomized complete block design with five replicates was used. Tomato plants were grown under fine mesh EFN (0.4-mm pore diameter) cover, large mesh EFN (0.9-mm pore diameter) cover or FRC. The EFN and FRC were maintained either permanently closed or opened thrice a week from 9 am to 3 pm. Two open control treatments were used: unsprayed (untreated control) or sprayed with chemicals (treated control). The use of EFN or FRC modified the microclimate with higher temperatures, lower diurnal temperature ranges, and higher volumetric water content recorded compared with the controls. On the other hand, light quantity and photosynthetic active radiation were reduced by the use of EFN and FRC compared with the controls. The use of FRC and EFN resulted in more fruit and higher percent in marketable yield compared with open field production. Fruit quality at harvest was also significantly improved by the use of EFN and FRC. Fruits with higher total soluble solids (TSS), lower titratable acidity (TA), and higher sugar acid ratio were obtained in EFN and FRC treatments compared with the controls. Fruits harvested from EFN and FRC were also firmer compared with control fruits. These findings demonstrate the potential of EFN and FRC in modifying microclimate conditions and improving yields and quality of tomato under tropical field conditions. (Résumé d'auteur)

<http://dx.doi.org/10.4236/as.2013.411078> Cirad-Agritrop Dk : 571624

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

8.4.1. Le quinoa

202

Bazile, D., Salcedo, S., and Santivañez, T. (2014)

Conclusiones: desafíos entre oportunidades y amenazas para el futuro de la quinua en torno a los cambios globales. In "Estado del arte de la quinua en el mundo en 2013. - Santiago : FAO, 2014", pp. 708-712.

<http://www.fao.org/3/a-i4042s/index.html> Cirad-Agritrop Dk : 574158

203

Ruiz, K. B., Biondi, S., Oses, R., Acuña-Rodríguez, I. S., Antognoni, F., Martínez-Mosqueira, E. A., Coulibaly, A., Canahua-Murillo, A., Pinto, M., Zurita, A., Bazile, D., Jacobsen, S.-E., and Molina Montenegro, M. (2014)

Quinoa biodiversity and sustainability for food security under climate change. A review

Quinoa biodiversity and sustainability for food security under climate change. A review

Agronomy for sustainable development vol.34:n°2

Climate change is rapidly degrading the conditions of crop production. For instance, increasing salinization and aridity is forecasted to increase in most parts of the world. As a consequence, new stress-tolerant species and genotypes must be identified and used for future agriculture. Stress-tolerant species exist but are actually underutilized and neglected. Many stress-tolerant species are indeed traditional crops that are only cultivated by farmers at a local scale. Those species have a high biodiversity value. Besides, the human population will probably reach nine billion within coming decades. To keep pace with population growth, food production must increase dramatically despite the limited availability of cultivable land and water. Here, we review the benefits of quinoa, *Chenopodium quinoa* Willd., a seed crop that has endured the harsh bioclimatic conditions of the Andes since ancient times. Although the crop is still mainly produced in Bolivia and Peru, agronomic trials and cultivation are spreading to many other countries. Quinoa maintains productivity on rather poor soils and under conditions of water shortage and high salinity. Moreover, quinoa seeds are an exceptionally nutritious food source, owing to their high protein content with all essential amino acids, lack of gluten, and high content of several minerals, e.g., Ca, Mg, Fe, and health-promoting compounds such as flavonoids. Quinoa has a vast genetic diversity resulting from its fragmented and localized production over the centuries in the Andean region, from Ecuador to southern Chile, and from sea level to the altiplano. Quinoa can be adapted to diverse agroecological conditions worldwide. Year 2013 has therefore been declared the International Year of Quinoa by the United Nations Food and Agriculture Organization. Here, we review the main characteristics of quinoa, its origin and genetic diversity, its exceptional tolerance to drought and salinity, its nutritional properties, the reasons why this crop can offer several ecosystem services, and the role of Andean farmers in preserving its agrobiodiversity. Finally, we propose a schematic model integrating the fundamental factors that should determine the future utilization of quinoa, in terms of food security, biodiversity conservation, and cultural identity. (Résumé d'auteur)

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Articles publiés dans une revue à facteur d'impact

204

Coulibaly, A., Sangaré, A., Konate, M., Traoré, S., Ruiz, K. B., Martinez, E. A., Zurita, A., Antognoni, F., Biondi, S., Maldonado, S., Léon, P., and Bazile, D. (2014)

Evaluación de quinoa (*Chenopodium quinoa* Willd.) y adaptación a las condiciones agroclimáticas de Mali, África Oeste: Un ejemplo de colaboración Sur-Norte-Sur. In "Estado del arte de la quinua en el mundo en 2013. - Santiago : FAO, 2014", pp. 635-646.

La adaptación de quinua en Mali, África del Oeste, se probó dada la similitud de las condiciones agroclimáticas estresantes con el centro-norte de Chile. Las variedades campesinas usadas fueron en su mayoría de Chile (A64, BO25, BO78, PRP, PRJ, UDeC9, R49, VI-1, Regalona, Mix) más dos cultivares de cosechas Argentinas (Roja Tastina y Sajama, variedad Boliviana) y uno más proveniente de Bolivia. Los ensayos comenzaron en el 2007 y se han extendido hasta el presente. Se probaron siembras en temporada de lluvias (junio a octubre) y en temporada seca (noviembre a marzo). Se evaluaron plagas, enfermedades y rendimientos considerando las condiciones ecológicas de almacenamiento de granos y manejo más sustentables del suelo (compost). Algunos cultivares altiplánicos resultaron recalcitrantes (A64, R49 y MIX) mientras que se tuvo rendimientos más aceptables (1-2 Ton/ ha) para las variedades campesinas del centro-sur de Chile. Las semillas deben idealmente sembrarse cada estación para evitar degradación de su vigor a la germinación por la humedad ambiental y altas temperaturas debido a condiciones naturales para la conservación in situ en zonas tropicales. El ciclo de cultivo puede ser desde 90-100 días para las accesiones de Chile, hasta 108-119 días para las accesiones de Argentina. Las panojas pueden ser atacadas por hongos que deciman la producción en la estación de lluvias. Se nota también la presencia de insectos fitófagos que pertenecen a los géneros *Bemisia*, *Aphis*, y *Aspavia*, mientras que *Coccinélidos* depredan sobre éstos, como control biológico. La quinua mejoraría la oferta proteica de alta calidad en África. Posibles plagas en temporadas húmedas, ataques de insectos son tal vez controlables con manejo ecológico, usando saponinas de las mismas quinuas. Limitante será la energía para usar aguas no fácilmente disponibles en la estación seca y para el desaponificado mecánico. El uso y aceptación por la población puede estimarse alto dada la experiencia de introducción de otros cultivos de América (papas, maíz, tomates) en este continente y la similitud culinaria con el mijo y el arroz. (Resumen del autor)

<http://www.fao.org/3/a-i4042s/index.html> Cirad-Agritrop Dk : 574156

205

Coulibaly, A., Sangaré, A., Konate, M., Traoré, S., Ruiz, K. B., Martinez, E. A., Zurita, A., Antognoni, F., Biondi, S., Maldonado, S., Léon, P., and Bazile, D. (2013)

Evaluación de quinoa (*Chenopodium quinoa* Willd.) y adaptación a las condiciones agroclimáticas de Mali, África Oeste: Un ejemplo de colaboración Sur-Norte-Sur : [Resumen].

In "Estado del arte de la quinua en el mundo en 2013: Libro de resúmenes. - Santiago : FAO, 2013", pp. 61-62.

La adaptación de quínoa en Mali, África del Oeste, se probó dada la similitud de las condiciones agroclimáticas estresantes con el centro-norte de Chile. Las variedades campesinas usadas fueron en mayoría de Chile (A64, BO25, BO78, PRP, PRJ, UDeC9, R49, VI-1, Regalona, Mix) más dos cultivares de cosechas Argentinas (Roja Tastina y Sajama, variedad Boliviana) y uno más proveniente de Bolivia. Los ensayos comenzaron en el 2007 y se han extendido hasta el presente. Se probaron siembras en temporada de lluvias (junio a octubre) y en temporada seca (noviembre a marzo). Se evaluaron plagas, enfermedades y rendimientos considerando las condiciones ecológicas de almacenamiento de granos y manejos más sustentables del suelo (compost). Los resultados indican que algunos cultivares altiplánicos resultaron recalcitrantes (A64, R49 y MIX) mientras se tuvo rendimientos más aceptables (1-2 Ton/ha) para las variedades campesinas del centro-sur de Chile. Las semillas deben idealmente sembrarse cada estación para evitar degradación de su vigor a la germinación por la humedad ambiental y altas temperaturas debido a condiciones naturales para la conservación in situ en zonas tropicales. El ciclo de cultivo puede ser de 90-100 días para las accesiones de Chile, a 108-119 días para las accesiones de Argentina. Las panojas pueden ser atacadas por hongos que deciman la producción en la estación de lluvias. Se nota también la presencia de insectos fitófagos que pertenecen a los géneros Bemisia, Aphis, y Aspavia, mientras que Coccinélidos depredan sobre éstos, como control biológico. El potencial de mejorar con el uso de la quínoa la oferta proteica y de un alimento de alta calidad en África es alto. Posibles plagas en temporadas húmedas, ataques de insectos son tal vez controlables con manejos ecológicos, usando saponinas de las mismas quínoas. Limitante será la energía para usar aguas no fácilmente disponibles en la estación seca y para el desaponificado mecánico. El uso y aceptación por la población puede estimarse alto dada la experiencia de introducción de otros cultivos de América (papas, maíz, tomates) en este continente. (Texte intégral)

Cirad-Agritrop Dk : 572300

206

Chevarria-Lazo, M., Bazile, D., Dessaix, D., Louafi, S., Trommetter, M., and Hocdé, H. (2014)

Los sistemas que regulan el intercambio de los recursos genéticos: importancia para el acceso, la circulación y la innovación en el caso de la quinua. *In "Estado del arte de la quinua en el mundo en 2013. - Santiago : FAO, 2014", pp. 95-123.*

A propuesta de la FAO, la Asamblea General de la ONU declaró el 2013 "Año Internacional de la Quinua" resaltando el rol que podría tener la biodiversidad de la quinua para la seguridad alimentaria mundial, en virtud de sus altos valores nutritivos y su gran potencial de adaptación a diferentes condiciones agroclimáticas. La declaración reconoce el rol de las comunidades andinas en la creación de esta biodiversidad y la conservación de múltiples variedades locales de quinua. La expansión actual de su cultivo en otros continentes continuará en los próximos años aunada a la generalización de sistemas de derechos de propiedad intelectual sobre las variedades o los genes, tal situación hace urgente un reconocimiento efectivo del aporte de los pueblos andinos, así como, la implementación de instrumentos que permitan una distribución justa y equitativa de los beneficios derivados de la utilización de los recursos genéticos de la quinua y de los conocimientos tradicionales asociados. Estos son los aspectos que trata el presente capítulo. Se identificaron cuatro metas principales: el reconocimiento de la identidad andina de los recursos genéticos de la quinua y de los conocimientos tradicionales vinculados a ésta; la conservación de los elementos constitutivos de la diversidad biológica y los ecosistemas; la utilización sostenible y eficaz de los recursos genéticos de la quinua que permitan promover la innovación; la distribución justa y equitativa de los beneficios derivados de la utilización de éstos recursos y de los conocimientos tradicionales asociados. Los marcos internacionales existentes no responden de manera satisfactoria a las cuestiones mencionadas. El CDB y el Protocolo de Nagoya regulan el acceso y la distribución de beneficios de manera bilateral, mientras que los recursos genéticos de la quinua son transfronterizos y en parte se encuentran dispersos desde hace décadas fuera de la zona andina. El Tratado Internacional sobre los Recursos Fitogenéticos útiles a la alimentación y a la agricultura - TIRFAA de la FAO - no considera los diferentes y numerosos usos no agrícolas y no alimentarios que se dan también en el caso de la

quinua, (usos medicinales, cosméticos, etc.). La conservación in situ de las variedades de quinua y la distribución justa y equitativa de la utilización de sus recursos genéticos a las poblaciones andinas son igualmente una de las limitaciones del TIRFAA. Los derechos de propiedad intelectual incluso sui generis, entre otros, las patentes, los COV, las indicaciones geográficas o las marcas colectivas se concentran sobre una pequeña parte del problema, (la regulación del acceso), éstos son temporales, (duración y validez limitadas), y no son reconocidos por todos los países. Los derechos de propiedad intelectual - DPI no se interesan en la conservación de los recursos genéticos, por tanto se debe encontrar o crear soluciones alternativas. Los Sistemas Ingeniosos del Patrimonio Agrícola Mundial (SIPAM) y los paisajes bioculturales de la Unesco toman en cuenta la conservación in situ para la protección de los sistemas agrarios que enriquecen la biodiversidad. Sin embargo, no están adaptados para abordar la conservación ex situ de la biodiversidad ni la distribución justa y equitativa de los beneficios derivados de la utilización de los recursos genéticos. Incluso si el Sistema de Licencias Abiertas de Semillas (Open Source Seed License en inglés) parece interesante como marco regulatorio para múltiples actores comprometidos en las diferentes etapas de producción, selección, difusión y conservación; no cuenta con un marco legal que le permita proteger el material genético intercambiado y evitar casos delictuosos. De otro lado, los parientes silvestres de los cultivos no están comprendidos por éstos sistemas que se interesan sobre todo en las variedades de las especies cultivadas. Finalmente, se constata que no existe un marco legal único capaz de tratar simultáneamente y globalmente estos cuatro aspectos identificados. La evidencia de vacíos en cada uno de estos instrumentos debería permitir la generación de propuestas para optimizarlos. Consecuentemente queda por construir colectivamente una solución que permita armonizar diferentes marcos legales existentes y/o inventar unos nuevos que los complementen. La rápida difusión de la quinua a nivel mundial ofrece una oportunidad a tomar en cuenta para reflexionar sobre las consecuencias de los instrumentos de regulación de los recursos genéticos actuales para mejorarlo e implementarlos nuevamente. (Resumen del autor)

<http://www.fao.org/3/a-i4042s/index.html> Cirad-Agritrop Dk : 574152

207

Chevarria-Lazo, M., Bazile, D., Dessaix, D., Louafi, S., Trommetter, M., and Hocdé, H. (2013) **Los sistemas que regulan el intercambio de los recursos genéticos: importancia para el acceso, la circulación y la innovación en el caso de la quinua : [Resumen].** In "Estado del arte de la quinua en el mundo en 2013: Libro de resúmenes. - Santiago : FAO, 2013", pp. 22-23.

A propuesta de la FAO, la Asamblea General de la ONU declaró el 2013 "Año Internacional de la Quinua" resaltando el rol que podría tener la biodiversidad de la quinua para la seguridad alimentaria mundial, en virtud de sus altos valores nutritivos y su gran potencial de adaptación a diferentes condiciones agroclimáticas. La declaración reconoce el rol de las comunidades andinas en la creación de esta biodiversidad y la conservación de múltiples variedades locales de quinua. La expansión actual de su cultivo en otros continentes continuará en los próximos años aunada a la generalización de sistemas de derechos de propiedad intelectual sobre las variedades o los genes, tal situación hace urgente un reconocimiento efectivo del aporte de los pueblos andinos, así como, la implementación de instrumentos que permitan una distribución justa y equitativa de los beneficios derivados de la utilización de los recursos genéticos de la quinua y de los conocimientos tradicionales asociados. Estos son los aspectos que trata el presente capítulo. Se identificaron cuatro metas principales: el reconocimiento de la identidad andina de los recursos genéticos de la quinua y de los conocimientos tradicionales vinculados a ésta; la conservación de los elementos constitutivos de la diversidad biológica y los ecosistemas; la utilización sostenible y eficaz de los recursos genéticos de la quinua que permitan promover la innovación; la distribución justa y equitativa de los beneficios derivados de la utilización de estos recursos y de los conocimientos tradicionales asociados. Los marcos internacionales existentes no responden de manera satisfactoria a las cuestiones mencionadas. El CDB y el Protocolo de Nagoya regulan el acceso y la distribución de beneficios de manera bilateral, mientras que los recursos genéticos de la quinua son transfronterizos y en parte se encuentran dispersos desde hace décadas fuera de la zona andina. El Tratado Internacional sobre los Recursos Fitogenéticos útiles a la alimentación y a la agricultura - TIRFAA de la FAO - no considera los diferentes y numerosos usos no agrícolas y no alimentarios que se dan también en el caso de la quinua, (usos medicinales, cosméticos, etc.). La conservación in situ de las variedades de quinua y la distribución justa y equitativa de la utilización de sus recursos genéticos a las poblaciones andinas son igualmente una de las limitaciones del TIRFAA. Los derechos de la propiedad intelectual incluso sui generis, entre otros, las patentes, los COV, las indicaciones geográficas o las marcas colectivas se concentran sobre una pequeña parte del problema, (la regulación del acceso), éstos son temporales, (duración y validez limitadas), y no son reconocidos por todos los países. Los derechos

de propiedad intelectual (DPI) no se interesan en la conservación de los recursos genéticos. Por tanto se debe encontrar o crear soluciones alternativas. Los Sistemas Ingeniosos del Patrimonio Agrícola Mundial (SIPAM) y los paisajes bioculturales de la UNESCO toman en cuenta la conservación in situ para la protección de los sistemas agrarios que enriquecen la biodiversidad. Sin embargo, no están adaptados para abordar la conservación ex situ de la biodiversidad ni la distribución justa y equitativa de los beneficios derivados de la utilización de los recursos genéticos. Incluso si el Sistema de Licencias Abiertas de Semillas (Open Source Seed License en inglés) parece interesante como marco regulatorio para múltiples actores comprometidos en las diferentes etapas de producción, selección, difusión y conservación; no cuenta con un marco legal que le permita proteger el material genético intercambiado y evitar casos delictuosos. De otro lado, los parientes silvestres de los cultivos no están comprendidos por éstos sistemas que se interesan sobre todo en las variedades de las especies cultivadas. Finalmente, se constata que no existe un marco legal único capaz de tratar simultáneamente y globalmente estos cuatro aspectos identificados. La evidencia de vacíos en cada uno de estos instrumentos debería permitir la generación de propuestas para optimizarlos. Consecuentemente queda por construir colectivamente una solución que permita armonizar diferentes marcos legales existentes y/o inventar unos nuevos que los complementen. La rápida difusión de la quinua a nivel mundial ofrece una oportunidad a tomar en cuenta para reflexionar sobre las consecuencias de los instrumentos de regulación de los recursos genéticos actuales para mejorarllos e implementarlos nuevamente. (Texte intégral)

Cirad-Agritrop Dk : 572282

208

Ceccato, D., Delatorre-Herrera, J., Burrieza, H., Bertero, H. D., Martinez, E. A., Delfino, I., Moncada, S., Bazile, D., and Castellón, M. (2014)

Fisiología de las semillas y respuesta a las condiciones de germinación. In "Estado del arte de la quinua en el mundo en 2013. - Santiago : FAO, 2014", pp. 153-166.

En este capítulo se reúnen los conocimientos sobre el comportamiento germinativo y en conservación de semillas de quinua a través de tres aspectos generales: la respuesta de la germinación a diferentes factores y ante situaciones de estrés, la tolerancia al brotado pre-cosecha y el control de la dormición, y la dinámica de envejecimiento y longevidad potencial de las semillas en conservación. Las semillas de quinua mostraron capacidad de germinar a temperaturas cercanas a cero y tolerancia a exposiciones breves a heladas en algunos casos. Accesiones que provienen de zonas salinas y áridas tienen en general mayor tolerancia al estrés hídrico y la salinidad, producto de su adaptación. No obstante, la diferenciación de los efectos de la salinidad en iónico y osmótico reveló diversas respuestas y niveles de tolerancia en accesiones de diferente origen. El brotado pre-cosecha es uno de los problemas que limitan la expansión del cultivo de quinua hacia regiones húmedas. El estudio del comportamiento germinativo en accesiones con dormición permitió determinar el efecto de factores ambientales (temperatura y fotoperíodo), hormonales (ABA y GA3) y estructurales (espesor de cubiertas) sobre el nivel de dormición de semillas de quinua durante su desarrollo, maduración y almacenamiento. Las semillas de quinua poseen la capacidad de tolerar la pérdida de agua y mantener la viabilidad, recuperando las funciones vitales al ser rehidratadas. La cinética de las reacciones de deterioro conducentes a la pérdida de viabilidad está determinada principalmente por el grado de movilidad del agua de multicapas. Entre las reacciones de deterioro se destacan la lipooxidación y la formación de compuestos de Maillard. Existen referencias sobre diferencias en la tolerancia al almacenamiento de diferentes cultivares, pero no son concluyentes en cuanto a la asociación entre la longevidad y las características de las regiones de origen. (Resumen del autor)

<http://www.fao.org/3/a-i4042s/index.html> Cirad-Agritrop Dk : 574153

209

Ceccato, D., Delatorre-Herrera, J., Burrieza, H., Bertero, H. D., Martinez, E. A., Delfino, I., Moncada, S., Bazile, D., and Castellón, M. (2013)

Fisiología de las semillas y respuesta a las condiciones de germinación : [Resumen]. In "Estado del arte de la quinua en el mundo en 2013: Libro de resúmenes. - Santiago : FAO, 2013", pp. 28.

En este capítulo se reúnen los conocimientos sobre el comportamiento germinativo y en conservación de semillas de quinua a través de tres aspectos generales: la respuesta de la germinación a diferentes factores y ante situaciones de estrés, la tolerancia al brotado pre-cosecha y el control de la dormición, y la dinámica de envejecimiento y longevidad potencial de las semillas en conservación. Las semillas de quinua mostraron capacidad de germinar a temperaturas cercanas a cero y tolerancia a exposiciones breves a heladas en algunos casos. Accesiones que provienen de zonas salinas y áridas tienen en general mayor tolerancia al estrés hídrico y la salinidad, producto de su adaptación.

No obstante, la diferenciación de los efectos de la salinidad en iónico y osmótico reveló diversas respuestas y niveles de tolerancia en accesiones de diferente origen. El brotado pre-cosecha es uno de los problemas que limitan la expansión del cultivo de quinua hacia regiones húmedas. El estudio del comportamiento germinativo en accesiones con dormición permitió determinar el efecto de factores ambientales (temperatura y fotoperíodo), hormonales (ABA y Ga3) y estructurales (espesor de cubiertas) sobre el nivel de dormición de semillas de quinua durante su desarrollo, maduración y almacenamiento. Las semillas de quinua poseen la capacidad de tolerar la pérdida de agua y mantener la viabilidad, recuperando las funciones vitales al ser rehidratadas. La cinética de las reacciones de deterioro conducentes a la pérdida de viabilidad está determinada principalmente por el grado de movilidad del agua de multicasas. Entre las reacciones de deterioro se destacan la lipooxidación y la formación de compuestos de Maillard. Existen referencias sobre diferencias en la tolerancia al almacenamiento de diferentes cultivares, pero no son concluyentes en cuanto a la asociación entre la longevidad y las características de las regiones de origen. (Texte intégral)

Cirad-Agritrop Dk : 572285

210

Biondi, S., Ruiz, K. B., Martinez, E. A., Zurita-Silva, A., Orsini, F., Antognoni, F., Dinelli, G., Marotti, I., Gianquinto, G., Maldonado, S., Burrieza, H., Bazile, D., Adolf, V. I., and Jacobsen, S.-E. (2013)

Tolerance to saline conditions. In "Estado del arte de la quinua en el mundo en 2013: Libro de resúmenes. - Santiago : FAO, 2013", pp. 29.

Salinity is today amongst the most widespread constraints in irrigated agriculture. Thus, salt tolerance is an agronomically important trait that is receiving increasing attention among scientists worldwide. Quinoa is tolerant to soil salinity and other adverse environmental factors, hence attracting the attention of researchers as a possible crop in a changing world scenario in which scarcity of water resources and increasing soil and water salinization are the primary causes of crop loss. Quinoa's exceptional tolerance to salinity, frost, drought and other types of abiotic stress also makes it a model species for investigating cellular, physiological, bio-molecular and morphological mechanisms at the basis of stress tolerance in halophytes and in plants as a whole. There are quinoa ecotypes adapted to valley, altiplano, salt desert, sea level and tropics, which display broad genetic variability in salinity tolerance. For this reason, quinoa represents a valuable resource for selection of the most suitable material and for breeding new varieties adapted to different environmental and geographical conditions. In this chapter, scientific studies on salinity tolerance in quinoa conducted in the last decade by numerous research groups operating in at least nine different countries are described. We focus on studies in which different quinoa genotypes are compared for their response to saline conditions, demonstrating that salt tolerance is a complex, multigenic trait involving a plethora of physiological and structural adaptations. Results available up to now regarding the effect of salinity on the nutritional properties of quinoa are reported. (Texte intégral)

Cirad-Agritrop Dk : 572291

8.4.2. Le riz

211

Julia, C., and Dingkuhn, M. (2013)

Predicting temperature induced sterility of rice spikelets requires simulation of crop-generated microclimate

Predicting temperature induced sterility of rice spikelets requires simulation of crop-generated microclimate

European journal of agronomy vol.49

Extreme temperatures cause spikelet sterility in rice and thus yield losses. Predicting sterility is difficult because organ temperature may differ from air temperature. Four rice genotypes were planted under irrigated flooded conditions in a similar replicated design in four environments: the relatively humid dry season in the Philippines, the summer season in southern France and the cold-dry and hot-dry seasons in northern Senegal. Panicle temperature was measured by IR photography on ca. 4000 images, complemented with simultaneous monitoring of micro-climatic variables on the floodwater-canopy-air continuum. Spikelet sterility was observed at the population scale at grain maturity, and canopy morphology was also characterized (plant height, leaf area index, panicle position within the canopy and panicle exertion). The period and time of day of anthesis (TOA) was estimated using a model developed on the same experiments as described in a previous paper. Panicle temperature varied between 9.5 °C below and 2 °C above air temperature at 2 m. During TOA it was on average slightly warmer than the air in the Philippines and significantly colder in Senegal. Spikelet sterility was

disaggregated into three components caused by chilling at microspore stage, incomplete panicle exertion at anthesis and high panicle temperature at anthesis. Chilling caused up to 100% and heat up to 40% sterility, the former mainly in the Senegal cool-dry season and the latter in the Philippines. All genotypes avoided heat sterility in the hot-dry season in Senegal despite air temperatures up to 40 °C, by a combination of escape (early TOA) and avoidance (transpiration cooling). Only one genotype had no chilling induced sterility due to physiological tolerance. It is concluded that heat stress causing sterility is more likely to occur in warm-humid than hot-arid environments due to humidity effects on transpiration cooling. Models predicting global warming effects on sterility losses need to consider microclimate and organ temperature, and research is now needed on the genetic control of panicle transpiration cooling. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.eja.2013.03.006> Cirad-Agritrop Dk : 569233

Articles publiés dans une revue à facteur d'impact

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Pasuquin, E. M., Hasegawa, T., Eberbach, P., Reinke, R. F., Wade, L. J., and Lafarge, T. (2013)

Responses of eighteen rice (#Oryza sativa# l.) cultivars to temperature tested using two types of growth chambers

Responses of eighteen rice (#Oryza sativa# l.) cultivars to temperature tested using two types of growth chambers

Plant production science vol.16:n°3

Genetic variation in the growth response to temperature is a basis for developing adaptation measures to global warming, but evaluation of cultivars for the temperature responses may depend on other environmental factors such as light. In this study, we tested the growth responses of 18 diverse rice cultivars to constant day/night temperature of 25, 28, 31 and 34°C in artificially-lit growth chambers (ALC) in Wagga Wagga (7.8 MJ m⁻² d⁻¹), and in naturally-lit chambers (NLC) in Yanco (25 and 28°C and 13.4 MJ m⁻² d⁻¹; 31 and 34°C and 11.5 MJ m⁻² d⁻¹), both in NSW, Australia. There was a significant interaction between temperature and chamber type for total shoot and panicle biomass; total shoot biomass was largest at 31°C in ALC, and at 25 and 28°C in NLC. From the average of all temperatures, the total shoot biomass declined by 29.5% in plants grown in ALC compared with those grown in NLC. Importantly, cultivar performance in ALC was similar to that in NLC at these temperatures, as evidenced by the highly significant correlation in total shoot biomass between ALC and NLC. Among 18 cultivars, IR64, IR72, N22, Vandana, Takanari and Koshihikari commonly produced a larger total shoot biomass under higher temperature conditions. Leaf area at earlier measurement date was highly correlated with the final total shoot biomass at the higher temperature more than specific leaf area. (Résumé d'auteur)

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Articles publiés dans une revue à facteur d'impact

213

Ayadi, M., Mieulet, D., Fabre, D., Verdeil, J.-L., Vernet, A., Guiderdoni, E., and Masmoudi, K. (2014)

Functional analysis of the durum wheat gene #Td#PIP2;1 and its promoter region in response to abiotic stress in rice

Functional analysis of the durum wheat gene #Td#PIP2;1 and its promoter region in response to abiotic stress in rice

Plant physiology and biochemistry vol.79

In a previous work, we demonstrated that expression of TdPIP2;1 in *Xenopus* oocytes resulted in an increase in Pf compared to water injected oocytes. Phenotypic analyses of transgenic tobacco plants expressing TdPIP2;1 generated a tolerance phenotype towards drought and salinity stresses. To elucidate its stress tolerance mechanism at the transcriptional level, we isolated and characterized the promoter region of the TdPIP2;1 gene. A 1060-bp genomic fragment upstream of the TdPIP2;1 translated sequence has been isolated, cloned, and designated as the proTdPIP2;1 promoter. Sequence analysis of proTdPIP2;1 revealed the presence of cis regulatory elements which could be required for abiotic stress responsiveness, for tissue-specific and vascular expression. The proTdPIP2;1 promoter was fused to the bglucuronidase (gusA) gene and the resulting construct was transferred into rice (cv. Nipponbare). Histochemical analysis of proTdPIP2;1::Gus in rice plants revealed that the GUS activity was observed in leaves, stems and roots of stably transformed rice T3 plants. Histological sections prepared revealed accumulation of GUS products in phloem, xylem and in some cells adjacent to xylem. The transcripts were up-regulated by dehydration. Transgenic rice plants overexpressing proTdPIP2;1 in fusion with TdPIP2;1, showed enhanced drought tolerance, while wild type plants were more sensitive and exhibited symptoms of wilting and chlorosis. These

findings suggest that expression of the TdPIP2;1 gene regulated by its own promoter achieves enhanced drought tolerance in rice. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.plaphy.2014.02.018> Cirad-Agritrop Dk : 573137

Articles publiés dans une revue à facteur d'impact

214

Rebolledo, M. C., Luquet, D., Courtois, B., Henry, A., Soulie, J.-C., Rouan, L., and Dingkuhn, M. (2013)

Can early vigour occur in combination with drought tolerance and efficient water use in rice genotypes?

Can early vigour occur in combination with drought tolerance and efficient water use in rice genotypes?

Functional plant biology vol.40:n°6

Selection for early vigour can improve rice (*Oryza sativa* L.) seedlings' access to resources, weed competitiveness and yield. Little is known about the relationships between early vigour and drought tolerance. This study explored a panel of 176 rice genotypes in a controlled environment regarding a diversity of traits and trait combinations related to early vigour and water use under drought. The design excluded genotypic differences for root depth. We hypothesised that early vigour (as determined by biomass accumulation under well-watered conditions) was not independent from drought tolerance (determined by biomass accumulation maintenance under drought). Leaf size, developmental rate (DR) and tiller number contributed positively to shoot DW and leaf area, and thus vigour. Early vigour was negatively correlated with growth maintenance and water use efficiency under drought, suggesting tradeoffs. Three clusters of genotypes were identified based on the constitutive traits DR, specific leaf area, tiller number and leaf size. The less droughttolerant cluster, mainly with lowland *O. sativa* indica rices, showed a sensitive transpiration response to the fraction of transpirable soil water; however, under well-watered conditions these genotypes were vigorous, with small leaves, high DR and high tillering. This experiment showed that the tradeoff between early vigour and drought tolerance was physiological and not a matter of access to water. The results are discussed with a view to identify drought adaptation strategies for crop improvement. Further improvement of multitrait phenotyping approaches is proposed. (Résumé d'auteur)

<http://dx.doi.org/10.1071/FP12312> Cirad-Agritrop Dk : 569569

Articles publiés dans une revue à facteur d'impact

215

Diagne, A., Alia, D., Amovin-Assagba, E., Wopereis, M., Saito, K., and Nakelse, T. (2013)

Farmer perceptions of the Biosphysical constraints to rice production in sub-Saharan Africa, and potential impact of research. In "Realizing Africa's rice promise. - Wallingford : CABI, 2013", pp. 46-68.

Cirad-Agritrop : CD_X130 WOP 16735 Dk : 572527

216

Saito, K., Nelson, A., Zwart, S. J., Niang, A., Sow, A., Yoshida, H., and Wopereis, M. (2013)

Towards a better understanding of biophysical determinants of yield gaps and the potential for expansion fo the rice area in Africa. In "Realizing Africa's rice promise. - Wallingford : CABI, 2013", pp. 188-203.

Cirad-Agritrop : CD_X130 WOP 16735 Dk : 572566

217

Shrestha, S. P., Asch, F., Brueck, H., Giese, M., Dusserre, J., and Ramanantsoanirina, A. (2013)

Phenological responses of upland rice grown along an altitudinal gradient

Phenological responses of upland rice grown along an altitudinal gradient

Environmental and experimental botany vol.89

High altitude upland rice (*Oryza sativa* L.) production systems are expected to benefit from climate change induced increase in temperatures. The potential yield of rice genotypes is governed by the thermal environment experienced during crop development phases when yield components are determined. Thus, knowledge on genotypic variability in phenotypic responses to variable temperature is required for assessing the adaptability of rice production to changing climate. Although, several crop models are available for this task, genotypic thermal constants used to simulate crop phenology vary strongly among the models and are under debate. Therefore, we conducted field trials with ten contrasting upland rice (*O. sativa* L.) genotypes on three locations along an altitudinal gradient with

five monthly staggered sowing dates for two years in Madagascar with the aim to study phenological responses at different temperature regimes. We found that, crop duration is equally influenced by genotype selection, sowing date and year in the high altitude. In contrast, in mid altitudes genotype has no effect on crop duration. At low altitudes crop duration is more affected by sowing date. Grain yield is strongly affected by low temperatures at high altitudes and severely influenced by frequent tropical cyclones at low altitudes. In high altitude, genotype explained 68% of variation in spikelet sterility, whereas in mid and low altitudes environment explained more than 70% of the variation. The phenological responses determining crop duration and yield, the basic genotypic thermal constants, and the analyses of genotypic thermal responses with regard to spikelet sterility reported here, provide valuable information for the improvement of rice phenological models urgently needed to develop new genotypes and better adapted cropping calendars. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.envexpbot.2012.12.007> Cirad-Agritrop Dk : 567791

Articles publiés dans une revue à facteur d'impact

218

Stuerz, S., Sow, A., Muller, B., Manneh, B., and Asch, F. (2014)

Canopy microclimate and gas-exchange in response to irrigation system in lowland rice in the Sahel

Canopy microclimate and gas-exchange in response to irrigation system in lowland rice in the Sahel
Field crops research vol.163

In lowland rice production, water-saving irrigation technologies have been developed, but it has rarely been considered that the absence of a ponded water layer could change the field's microclimate due to the different thermal characteristics of water compared to air. At a site in the Senegal River valley, canopy and soil temperature as well as temperature at meristem level and relative humidity inside the canopy were observed in the presence and absence of a ponded water layer in an irrigated rice field. Gas-exchange measurements were conducted at different development stages of three varieties (IR4630, IR64, and Sahel108) sown in bi-monthly intervals and the effects of climatic and microclimatic parameters on stomatal conductance, assimilation rate, and intrinsic water use efficiency were investigated. Minimum soil (T_{smin}) and meristem temperature (TM_{min}) were usually lower in the absence of a ponded water layer. Stomatal conductance depended mainly on T_{smin} , TM_{min} , and minimum relative humidity inside the canopy. Assimilation rate was positively correlated with solar radiation, T_{smin} and TM_{min} , but depended mainly on stomatal conductance. Without standing water, stomatal conductance was significantly lower, but reductions could be explained with lower T_{smin} and/or TM_{min} . Nevertheless, T_{smin} and/or TM_{min} were the major determinants of stomatal conductance and assimilation rate, which suggests a pivotal role of root zone temperature on plant growth probably via water uptake and, thus, overall plant water status. Varietal differences were found, with assimilation rate in IR4630 and Sahel108 having been less affected by low temperature than in IR64. When water-saving irrigation measures are applied in irrigated rice, the negative effects of lower soil and meristem temperature in the absence of a ponded water layer in the field on the productivity of rice need to be considered. In regions where night temperatures below 20 °C occur, varieties should be used that are less temperature-responsive, if the effect of cool nights on meristem temperature cannot be mitigated by a ponded water layer. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.fcr.2014.04.002> Cirad-Agritrop Dk : 573422

Articles publiés dans une revue à facteur d'impact

219

Thanawong, K., Perret, S., and Basset-Mens, C. (2014)

Eco-efficiency of paddy rice production in Northeastern Thailand: a comparison of rain-fed and irrigated cropping systems

Eco-efficiency of paddy rice production in Northeastern Thailand: a comparison of rain-fed and irrigated cropping systems

Journal of cleaner production vol.73

Northeastern Thailand is an essential production area for high-quality fragrant rice for both domestic use and export. While rain-fed conditions still largely prevail, plans to extend irrigation are being drafted. This paper compares the advantages of rice production under irrigation and rain-fed conditions in both environmental and economic terms. Indicators of techno-economic performances were combined with environmental impact indicators based upon life cycle assessment, energy and water use analyses. Data were collected in 2010 at the farm level in 43 households of Lam Sieo Yai Basin in North-Eastern Thailand, according to 3 cropping systems, namely wet-season rain-fed (Rw), wet-season irrigated (Iw) and dry-season irrigated (Id) systems. Eco-efficiency indicators were

calculated as per impact category. Wide-ranging techno-economic performances and environmental impacts were observed, while cropping practices were found to be homogeneous. Differentiation of systems originated mostly from differences in yield, which were mostly impacted by water supply. Yields vary from 2625 kg/ha in the Iw system to 2375 in the Rw system and 2188 in the Id system. The results highlight the low performances of Id systems in both techno-economic and environmental terms. Id systems require mostly blue water, while the two other systems rely primarily on green water. Id systems also require more energy and labour, due to increased water management needs. Overall, the productivity of most production factors was found to be higher in Rw and Iw systems; this results in return on investment being slightly higher in the Iw system compared to the Rw system (0.12 kg/THB and 0.11 kg/THB, respectively) and is lowest in the Id system (0.1 kg/THB) where THB is Thai baht, currency of Thailand. In Id systems, farmers need to produce twice as much rice (0.41 kg) to obtain 1 THB of net income, compared to 0.23 and 0.25 kg for Iw and Rw respectively. Emissions proved relatively similar across all 3 systems, with the exception of CH₄, which was markedly lower in Rw systems due to specific water and organic residue management. Id systems systematically emitted more nitrates, phosphates and pesticides into water sources. Rw systems showed the lowest environmental impacts per ha and per kg of paddy rice produced. GWP100 was higher in Id systems (5.55 kg CO₂-eq per kg of rice) compared to Iw (4.87) and Rw (2.97). Finally, Rw systems were found to be more eco-efficient in most impact categories, including Global Warming Potential. The total value product per kg of CO₂-eq emitted is 4, 2.5 and 2.2 THB in Rw, Iw, and Id systems respectively. This paper further discusses the results in view of contrasting perspectives, including societal objectives, farmer income and environmental integrity, and possible irrigation development in Northeastern Thailand. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.jclepro.2013.12.067> Cirad-Agritrop Dk : 573393

Articles publiés dans une revue à facteur d'impact

220

Perret, S., Thanawong, K., Basset-Mens, C., and Mungkung, R. (2013)

The environmental impacts of lowland paddy rice: A case study comparison between rainfed and irrigated rice in Thailand

The environmental impacts of lowland paddy rice: A case study comparison between rainfed and irrigated rice in Thailand

Cahiers agricultures vol.22:n°5

Le Nord-Est de la Thaïlande est une région essentielle pour la production de riz parfumé de haute qualité à usage domestique et à l'export. Alors que les systèmes pluviaux dominent, des plans d'extension de l'irrigation sont préparés. Cet article compare la production de riz en casier irrigué et en pluvial. Les performances technico-économiques et les impacts environnementaux ont été analysés conjointement, à l'aide des analyses du cycle de vie et des usages de l'énergie et de l'eau. Les données ont été collectées en 2010 dans 45 systèmes de culture du bassin de Lam Sieo Yai, selon trois systèmes : pluvial de saison humide (Rw), irrigué de saison humide (Iw) et irrigué de saison sèche (Id). On observe des performances et des impacts très différenciés, alors que les systèmes sont relativement homogènes. Ces différences entre systèmes proviennent essentiellement des rendements, eux-mêmes influencés par les apports d'eau. Les résultats soulignent les moindres performances et les impacts forts des systèmes Id. Ils requièrent de l'eau d'irrigation (eau bleue) alors que les autres consomment avant tout les précipitations utiles et le stock d'eau du sol (eau verte). Les systèmes Id consomment aussi plus d'énergie et de main-d'œuvre pour la gestion de l'irrigation. La productivité de la plupart des facteurs de production est supérieure dans les systèmes de saison humide Rw et Iw. Les rejets s'avèrent similaires dans tous les systèmes, à l'exception du CH 4, nettement moins émis par Rw en raison des modalités de gestion de l'eau et des résidus de culture. Les systèmes Id rejettent systématiquement plus de nitrates, de phosphates et de pesticides. Les systèmes Rw montrent les impacts les plus faibles, par hectare et par kilo de riz produit. Le potentiel de réchauffement climatique est en moyenne de 2,97 kg CO₂-eq par kilo de riz dans les systèmes Rw, 4,87 dans les systèmes Iw, et 5,55 dans les systèmes Id. Enfin, l'article discute les résultats, au regard des objectifs sociaux et de ceux des producteurs, du respect de l'environnement, et du possible développement de l'irrigation dans le Nord-Est de la Thaïlande. (Résumé d'auteur)

<http://dx.doi.org/10.1684/agr.2013.0663> Cirad-Agritrop : CD_PE1476; BA_PEBA764 Dk : 570889

Articles publiés dans une revue à facteur d'impact

221

Perret, S., Saringkarn, P., Jourdain, D., and Babel, M. S. (2013)

Can rice farmers pay irrigation costs? An investigation of irrigation supply costs and use value in a case study scheme in Thailand

Can rice farmers pay irrigation costs? An investigation of irrigation supply costs and use value in a case study scheme in Thailand

Cahiers agricultures vol.22:n°5

En Thaïlande, le secteur public consacre des budgets très importants au développement et au maintien des systèmes rizicoles irrigués. Au regard de la compétition croissante pour l'allocation des moyens publics, du poids relatif décroissant du secteur agricole dans l'économie domestique, des débats se font jour concernant le besoin de nouveau modes de financement de l'irrigation, y compris par la facturation des services de l'eau d'irrigation aux riziculteurs. L'article étudie la valeur d'usage de l'eau d'irrigation en riziculture et l'ensemble des coûts de l'approvisionnement en eau, sur la base d'une étude de cas, de façon à évaluer la faisabilité d'une telle facturation. Les incertitudes liées à la variabilité climatique ont été abordées par une analyse de sensibilité (Monte Carlo). Les analyses montrent que la valeur d'usage (0,35 THB/m³ [1 Thaï Baht = 0,03 US\$]) dépasse les coûts totaux encourus (0,1 THB/m³), et donc que les producteurs pourraient potentiellement payer. Cependant, ces résultats ont été obtenus en conditions de production favorables. Également, si les producteurs devaient couvrir les coûts totaux, y compris les coûts d'investissement (2,208 THB/ha par saison), leurs coûts de production augmenteraient alors de 36 % pour les deux saisons. Leur revenu net diminuerait alors de 36 % en saison humide et de 25 % en saison sèche. S'ils devaient couvrir uniquement les coûts de fonctionnement et d'entretien, les coûts de production augmenteraient de 23 %. Au regard de leurs revenus très faibles, de tels surcoûts ne sont pas envisageables. Par ailleurs, l'étude relève que les producteurs paient déjà pour le pompage de l'eau à la parcelle et sont donc bien conscients de la valeur économique de la ressource. La discussion aborde de possibles systèmes alternatifs de financement. En particulier, un système de facturation des services de l'eau d'irrigation qui inclurait d'autres acteurs en aval de la filière (moulins, export, détaillants) est envisageable. En intégrant les paysans, ce système peut réaffirmer leur statut au sein de la filière, à un coût acceptable. Enfin, une approche plus large par les services écosystémiques est discutée. (Résumé d'auteur)

<http://dx.doi.org/10.1684/agr.2013.0660> Cirad-Agritrop : CD_PE1476; BA_PEBA764 Dk : 570892

Articles publiés dans une revue à facteur d'impact

222

Clément, G., and Louvel, D. (2013)

Amélioration variétale du riz pour la France méditerranéenne

Amélioration variétale du riz pour la France méditerranéenne

Cahiers agricultures vol.22:n°5

En France, le riz est principalement cultivé en zone méditerranéenne, en Camargue. La riziculture irriguée, avec semis direct, y est majoritairement contrainte par l'occurrence de périodes froides et le risque de salinisation des sols. S'y ajoutent des périodes de vent du nord, froid et sec, qui peuvent intervenir tout au long du cycle cultural (avril-mai à septembre-octobre). Depuis 1988, le Centre de coopération internationale en recherche agronomique pour le développement (Cirad) et le Centre français du riz (CFR), conduisent en Camargue un programme d'amélioration variétale. Il vise à créer des cultivars satisfaisant les producteurs (niveau et régularité de la production), les riziers (rendement industriel et transformation) et les consommateurs (qualités de cuisson et de goût). Les riz cultivés en Camargue appartiennent à la sous-espèce japonica d'*Oryza sativa*. L'hybridation constitue la base de création de variabilité. Les descendances sont sélectionnées selon la méthode généalogique associée ou non à l'haplodiploïdisation appliquée à la première génération. La sélection assistée par marqueurs a été récemment introduite afin d'améliorer l'efficacité de la sélection vis-à-vis de contraintes comme les maladies cryptogamiques dont l'occurrence, en rapport avec le climat, est erratique. Vingt-cinq (25) variétés ont été inscrites au Catalogue officiel, parmi lesquelles 5 ont connu un succès certain auprès des producteurs. Les avancées obtenues pour l'aptitude à la levée en conditions anaérobies, la tolérance à la pyrale, le format et le caractère aromatique du grain sont discutées. Les perspectives en lien avec l'évolution des objectifs, tels que le contrôle des adventices ou l'adaptation au changement climatique, sont exposées. (Résumé d'auteur)

<http://dx.doi.org/10.1684/agr.2013.0647> Cirad-Agritrop : CD_PE1476; BA_PEBA764 Dk : 571316

Articles publiés dans une revue à facteur d'impact

223

Raboin, L.-M., Randriambololona, T., Radanielina, T., Ramanantsoanirina, A., Ahmadi, N., and Dusserre, J. (2014)

Upland rice varieties for smallholder farming in the cold conditions in Madagascar's tropical highlands

Upland rice varieties for smallholder farming in the cold conditions in Madagascar's tropical highlands
Field crops research vol.169

Upland rice cropping has become a familiar part of the landscape in Madagascar's central highlands, a densely populated region mainly characterized by resource poor family farmers and cold climatic conditions. A survey of 485 farmers conducted in 2011-2012 revealed that 71% of them cultivated upland rice although the crop was absent in this region before the first cold tolerant varieties were released in 1995. It also revealed that a single variety, Chhomrong Dhan (CD) originating from Nepal and released in 2006 was by far the most widely cultivated variety and accounted for 82.5% of the total acreage of upland rice. Farmers appreciate CD for its relatively high yield under low input conditions. However, this dominance raises concerns about the resilience of upland rice agro-systems in the face of changes in climatic conditions or in pathogen populations. To identify key varietal adaptive traits that should be taken into account in the breeding of new upland rice varieties in this context, we compared a panel of improved varieties including CD under low input management over two cropping seasons. A strong positive correlation between leaf area index (LAI) before harvest and yield was observed. Varieties with the highest yield, including CD, are of long duration, produce high biomass yields, have a high LAI and the highest harvest index. A significant negative correlation was observed between the LAI of rice varieties and that of weeds, showing that a high LAI also helps limit competition for resources by weeds. In the context of subsistence family farming and in the cold conditions of Madagascar's tropical highlands, new improved varieties should combine high LAI, high harvest index and long duration, as these traits help compete with weeds and contribute to high yield potential under low input management, on the one hand, and resistance to blast, cold tolerance and reduced crop duration, traits that prevent yield losses, on the other hand. The trade-off between crop duration and the risk of cold-induced sterility specific to the cold conditions of Madagascar highlands has to be taken into account. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.fcr.2014.09.006> Cirad-Agritrop Dk : 574760

Articles publiés dans une revue à facteur d'impact

224

Nwilene, F. E., Nacro, S., Tamo, M., Menozzi, P., Heinrichs, E. A., Hamadoun, A., Dakouo, D., and Adda, C. (2013)

Managing insect pests of rice in Africa. In "Realizing Africa's rice promise. - Wallingford : CABI, 2013", pp. 229-240.

Cirad-Agritrop : CD_X130 WOP 16735 Dk : 572567

225

Perret, S. (2013)

Utilisation de l'analyse du cycle de vie pour l'évaluation de l'efficacité écologique de riz paddy dans le nord-est de Thaïlande

Utilisation de l'analyse du cycle de vie pour l'évaluation de l'efficacité écologique de riz paddy dans le nord-est de Thaïlande

ICID News n°2

http://www.icid.org/icidnews_13_2f.pdf Cirad-Agritrop Dk : 570596

Articles publiés dans une revue sans comité de lecture

8.5. Productions animales et santé animale

8.5.1. Maladie et santé animale

226

Morand, S., Owers, K., Waret-Szkuta, A., McIntyre, K. M., and Baylis, M. (2013)

Climate variability and outbreaks of infectious diseases in Europe

Climate variability and outbreaks of infectious diseases in Europe

Scientific Reports vol.3:n°1774

Several studies provide evidence of a link between vector-borne disease outbreaks and El Niño driven climate anomalies. Less investigated are the effects of the North Atlantic Oscillation (NAO). Here, we test its impact on outbreak occurrences of 13 infectious diseases over Europe during the last fifty years, controlling for potential bias due to increased surveillance and detection. NAO variation statistically influenced the outbreak occurrence of eleven of the infectious diseases. Seven diseases

were associated with winter NAO positive phases in northern Europe, and therefore with above-average temperatures and precipitation. Two diseases were associated with the summer or spring NAO negative phases in northern Europe, and therefore with below-average temperatures and precipitation. Two diseases were associated with summer positive or negative NAO phases in southern Mediterranean countries. These findings suggest that there is potential for developing early warning systems, based on climatic variation information, for improved outbreak control and management. (Résumé d'auteur)

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Articles publiés dans une revue à facteur d'impact

227

Duong, V., Henn, M. R., Simmons, C., Chantha, N., Y, B., Gavotte, L., Viari, A., Ong, S., Huy, R., Lennon, N. J., Ly, S., Vong, S., Birren, B. W., Farrar, J. J., Deubel, V., Frutos, R., and Buchy, P. (2013)

Complex dynamic of dengue virus serotypes 2 and 3 in Cambodia following series of climate disasters

Complex dynamic of dengue virus serotypes 2 and 3 in Cambodia following series of climate disasters
Infection, genetics and evolution vol.15, spec. 2012-01-30/2012-02-03

The Dengue National Control Program was established in Cambodia in 2000 and has reported between 10,000 and 40,000 dengue cases per year with a case fatality rate ranging from 0.7 to 1.7. In this study 39 DENV-2 and 57 DENV-3 viruses isolated from patients between 2000 and 2008 were fully sequenced. Five DENV2 and four DENV3 distinct lineages with different dynamics were identified. Each lineage was characterized by the presence of specific mutations with no evidence of recombination. In both DENV-2 and DENV-3 the lineages present prior to 2003 were replaced after that date by unrelated lineages. After 2003, DENV-2 lineages D2-3 and D2-4 cocirculated until 2007 when they were almost completely replaced by a lineage D2-5 which emerged from D2-3 Conversely, all DENV-3 lineages remained, diversified and cocirculated with novel lineages emerging. Years 2006 and 2007 were marked by a high prevalence of DENV-3 and 2007 with a large dengue outbreak and a high proportion of patients with severe disease. Selective sweeps in DENV-1 and DENV-2 were linked to immunological escape to a predominately DENV-3-driven immunological response. The complex dynamic of dengue in Cambodia in the last ten years has been associated with a combination of stochastic climatic events, cocirculation, coevolution, adaptation to different vector populations, and with the human population immunological landscape. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.meegid.2012.05.012> Cirad-Agritrop Dk : 570099

Articles publiés dans une revue à facteur d'impact

228

McIntyre, K. M., Setzkorn, C., Hepworth, P. J., Morand, S., Morse, A. P., and Baylis, M. (2014)

A quantitative prioritisation of human and domestic animal pathogens in Europe

A quantitative prioritisation of human and domestic animal pathogens in Europe

PLoS One vol.9:n°8

Disease or pathogen risk prioritisations aid understanding of infectious agent impact within surveillance or mitigation and biosecurity work, but take significant development. Previous work has shown the H-(Hirsch-)index as an alternative proxy. We present a weighted risk analysis describing infectious pathogen impact for human health (human pathogens) and wellbeing (domestic animal pathogens) using an objective, evidence-based, repeatable approach; the H-index. This study established the highest H-index European pathogens. Commonalities amongst pathogens not included in previous surveillance or risk analyses were examined. Differences between host types (humans/animals/zoonotic) in pathogen Hindices were explored as a One Health impact indicator. Finally, the acceptability of the H-index proxy for animal pathogen impact was examined by comparison with other measures. 57 pathogens appeared solely in the top 100 highest H-indices (1) human or (2) animal pathogens list, and 43 occurred in both. Of human pathogens, 66 were zoonotic and 67 were emerging, compared to 67 and 57 for animals. There were statistically significant differences between H-indices for host types (humans, animal, zoonotic), and there was limited evidence that H-indices are a reasonable proxy for animal pathogen impact. This work addresses measures outlined by the European Commission to strengthen climate change resilience and biosecurity for infectious diseases. The results include a quantitative evaluation of infectious pathogen impact, and suggest greater impacts of human-only compared to zoonotic pathogens or scientific under-representation of zoonoses. The outputs separate high and low impact pathogens, and should

be combined with other risk assessment methods relying on expert opinion or qualitative data for priority setting, or could be used to prioritise diseases for which formal risk assessments are not possible because of data gaps. (Résumé d'auteur)

<http://dx.doi.org/10.1371/journal.pone.0103529> Cirad-Agritrop Dk : 573799

Articles publiés dans une revue à facteur d'impact

229

Tran, A., Sudre, B., Paz, S., Rossi, M., Desbrosse, A., Chevalier, V., and Semenza, J. C. (2014)

Environmental predictors of West Nile fever risk in Europe

Environmental predictors of West Nile fever risk in Europe

International Journal of Health Geographics vol.13:n°26

<http://dx.doi.org/10.1186/1476-072X-13-26> Cirad-Agritrop Dk : 574131

Articles publiés dans une revue à facteur d'impact

230

Durand, B., Tran, A., Leblond, A., Sandoz, A., and Bicout, D. (2013)

Facteurs de risques environnementaux pour la circulation du virus. In "Le virus du Nil occidental. - Versailles : Ed. Quae, 2013", pp. 157-175.

Cirad-Agritrop : CD_L73 BIC 16522; BA_L731 BIC 5722 Dk : 569928

231

Morand, S.-É. s., Moutou, F.-É. s., and Richomme, C.-É. s. (2014)

Resilience and development: mobilising for transformation, Ed. Quae, Versailles. 189 p.

La crise environnementale actuelle s'accompagne d'une crise de la biodiversité, et d'une crise épidémiologique marquée par des émergences de maladies infectieuses nouvelles issues de la faune sauvage et domestique. Existerait-il des liens entre biodiversité et transmission des pathogènes ? Les pertes de biodiversité s'accompagnent-elles d'une augmentation des risques sanitaires infectieux ? A l'inverse, la faune sauvage et la biodiversité au sens large subissent-elles l'usage des antibiotiques ? Les services rendus par les écosystèmes comme la pollinisation assurée par les abeilles sont-ils menacés par les pesticides ? La faune sauvage est-elle devenue, à son corps défendant, sentinelle de la qualité sanitaire de notre environnement ? (Résumé d'auteur)

Cirad-Agritrop : BA_P01 MOR 5886 Dk : 573958

232

Morand, S., Jittapalapong, S., Suputtamongkol, Y., Abdullah, M. T., and Huan, T. B. (2014)

Infectious diseases and their outbreaks in Asia-Pacific: Biodiversity and its regulation loss matter

Infectious diseases and their outbreaks in Asia-Pacific: Biodiversity and its regulation loss matter

PLoS One vol.9:n°2

Despite increasing control measures, numerous parasitic and infectious diseases are emerging, re-emerging or causing recurrent outbreaks particularly in Asia and the Pacific region, a hot spot of both infectious disease emergence and biodiversity at risk. We investigate how biodiversity affects the distribution of infectious diseases and their outbreaks in this region, taking into account socio-economics (population size, GDP, public health expenditure), geography (latitude and nation size), climate (precipitation, temperature) and biodiversity (bird and mammal species richness, forest cover, mammal and bird species at threat). We show, among countries, that the overall richness of infectious diseases is positively correlated with the richness of birds and mammals, but the number of zoonotic disease outbreaks is positively correlated with the number of threatened mammal and bird species and the number of vector-borne disease outbreaks is negatively correlated with forest cover. These results suggest that, among countries, biodiversity is a source of pathogens, but also that the loss of biodiversity or its regulation, as measured by forest cover or threatened species, seems to be associated with an increase in zoonotic and vector-borne disease outbreaks. (Résumé d'auteur)

<http://dx.doi.org/10.1371/journal.pone.0090032> Cirad-Agritrop Dk : 573078

Articles publiés dans une revue à facteur d'impact

233

Ferguson, K. J., Cleaveland, S., Haydon, D. T., Caron, A., Kock, R., Lembo, T., Hopcraft, J. G. C., Chardonnet, B., Nyariki, T., Keyyu, J., Paton, D. J., and Kivaria, F. M. (2013)

Evaluating the potential for the environmentally sustainable control of foot and mouth disease in Sub-Saharan Africa

Evaluating the potential for the environmentally sustainable control of foot and mouth disease in Sub-Saharan Africa

EcoHealth vol.10:n°3

Strategies to control transboundary diseases have in the past generated unintended negative consequences for both the environment and local human populations. Integrating perspectives from across disciplines, including livestock, veterinary and conservation sectors, is necessary for identifying disease control strategies that optimise environmental goods and services at the wildlife-livestock interface. Prompted by the recent development of a global strategy for the control and elimination of foot-and-mouth disease (FMD), this paper seeks insight into the consequences of, and rational options for potential FMD control measures in relation to environmental, conservation and human poverty considerations in Africa. We suggest a more environmentally nuanced process of FMD control that safe-guards the integrity of wild populations and the ecosystem dynamics on which human livelihoods depend while simultaneously improving socio-economic conditions of rural people. In particular, we outline five major issues that need to be considered: 1) improved understanding of the different FMD viral strains and how they circulate between domestic and wildlife populations; 2) an appreciation for the economic value of wildlife for many African countries whose presence might preclude the country from ever achieving an FMD-free status; 3) exploring ways in which livestock production can be improved without compromising wildlife such as implementing commodity-based trading schemes; 4) introducing a participatory approach involving local farmers and the national veterinary services in the control of FMD; and 5) finally the possibility that transfrontier conservation might offer new hope of integrating decision-making at the wildlife-livestock interface. (Résumé d'auteur)

<http://dx.doi.org/10.1007/s10393-013-0850-6> Cirad-Agritrop Dk : 571634

Articles publiés dans une revue à facteur d'impact

234

Faye, B. (2014)

Anatomical and physiological adaptation of domestic animals to ecosystem constraints : The example of the camel in arid lands

Anatomical and physiological adaptation of domestic animals to ecosystem constraints : The example of the camel in arid lands

KazNu Bulletin. Biology series vol.60:n°1-2

Cirad-Agritrop Dk : 572631

Articles publiés dans une revue sans comité de lecture

8.5.1.1. Moustiques et tiques

235

Mardulyn, P., Goffredo, M., Conte, A. A., Hendrickx, G., Meiswinkel, R., Balenghien, T., Sghaier, S., Lohr, Y., and Gilbert, M. (2013)

Climate change and the spread of vector-borne diseases: using approximate Bayesian computation to compare invasion scenarios for the bluetongue virus vector #Culicoides imicola# in Italy

Molecular Ecology vol.22:n°9

Bluetongue (BT) is a commonly cited example of a disease with a distribution believed to have recently expanded in response to global warming. The BT virus is transmitted to ruminants by biting midges of the genus Culicoides, and it has been hypothesized that the emergence of BT in Mediterranean Europe during the last two decades is a consequence of the recent colonization of the region by Culicoides imicola and linked to climate change. To better understand the mechanism responsible for the northward spread of BT, we tested the hypothesis of a recent colonization of Italy by C. imicola, by obtaining samples from more than 60 localities across Italy, Corsica, Southern France, and Northern Africa (the hypothesized source point for the recent invasion of C. imicola), and by genotyping them with 10 newly identified microsatellite loci. The patterns of genetic variation within and among the sampled populations were characterized and used in a rigorous approximate Bayesian computation framework to compare three competing historical hypotheses related to the arrival and establishment of C. imicola in Italy. The hypothesis of an ancient presence of the insect vector was strongly favoured by this analysis, with an associated P < 99%, suggesting that causes other than the northward range expansion of C. imicola may have supported the emergence of BT in southern Europe. Overall, this study illustrates the potential of molecular genetic markers for exploring the assumed link between climate change and the spread of diseases. (Résumé d'auteur)

<http://dx.doi.org/10.1111/mec.12264> Cirad-Agritrop Dk : 568738

Articles publiés dans une revue à facteur d'impact

236

Lacetera, N., Segnalini, M., Bernabucci, U., Ronchi, B., Vitali, A., Tran, A., Guis, H., Caminade, C., Calvete, C., Morse, A. P., Baylis, M., and Nardonne, A. (2013)

Climate induced effects on livestock population and productivity in the mediterranean area. In "Regional assessment of climate change in the Mediterranean. - Dordrecht : Springer [Pays-Bas], 2013", pp. 135-156.

The ability of livestock to breed, grow, and lactate to their maximal genetic potential, and their capacity to maintain health is affected by climatic features. Climate affects animals both indirectly and directly. Indirect effects include those that climate exerts on grassland and crops, and on water availability. Additionally, climate may also affect survival of pathogens and/or their vectors, which may cause risks for health in animal and human populations. Analysis of meteorological and entomological data indicate that climate has favored invasion of Culicoides imicola into new regions of the Mediterranean basin where it was previously absent. The meteorological complex has not been studied precisely to determine the optimal combination for normal physiological functions and behavioral actions, health, welfare, and maximal performance of livestock. An index for measurements of environmental warmth and its direct effects in livestock is the Temperature Humidity Index (THI). The THI combines values of temperature and humidity and has been widely used as a bioclimatic indicator of thermal stress in livestock. Studies carried out within the CIRCE project permitted to characterize the Mediterranean basin in terms of THI and to establish its strong heterogeneity even if most of the area is at risk of heat stress for farm animals during summer. The same studies also indicated that the area will be also subjected to warming and extreme climate events, which may aggravate the consequences of hot weather in livestock. Comprehensive frameworks need to be developed to identify and target adaptation options that are appropriate for specific contexts. (Résumé d'auteur)

Cirad-Agritrop : CD_P40 NAV 16516B Dk : 569545

237

Le Flohic, G., Porphyre, V., Barbazan, P., and Gonzalez, J.-P. (2013)

Review of climate, landscape, and viral genetics as drivers of the japanese encephalitis virus ecology

Review of climate, landscape, and viral genetics as drivers of the japanese encephalitis virus ecology
PLoS Neglected tropical diseases vol.7:n°9

The Japanese encephalitis virus (JEV), an arthropod-born Flavivirus, is the major cause of viral encephalitis, responsible for 10,000-15,000 deaths each year, yet is a neglected tropical disease. Since the JEV distribution area has been large and continuously extending toward new Asian and Australasian regions, it is considered an emerging and reemerging pathogen. Despite large effective immunization campaigns, Japanese encephalitis remains a disease of global health concern. JEV zoonotic transmission cycles may be either wild or domestic: the first involves wading birds as wild amplifying hosts; the second involves pigs as the main domestic amplifying hosts. Culex mosquito species, especially Cx. tritaeniorhynchus, are the main competent vectors. Although five JEV genotypes circulate, neither clear-cut genotype-phenotype relationship nor clear variations in genotype fitness to hosts or vectors have been identified. Instead, the molecular epidemiology appears highly dependent on vectors, hosts' biology, and on a set of environmental factors. At global scale, climate, land cover, and land use, otherwise strongly dependent on human activities, affect the abundance of JEV vectors, and of wild and domestic hosts. Chiefly, the increase of rice-cultivated surface, intensively used by wading birds, and of pig production in Asia has provided a high availability of resources to mosquito vectors, enhancing the JEV maintenance, amplification, and transmission. At fine scale, the characteristics (density, size, spatial arrangement) of three landscape elements (paddy fields, pig farms, human habitations) facilitate or impede movement of vectors, then determine how the JEV interacts with hosts and vectors and ultimately the infection risk to humans. If the JEV is introduced in a favorable landscape, either by live infected animals or by vectors, then the virus can emerge and become a major threat for human health. Multidisciplinary research is essential to shed light on the biological mechanisms involved in the emergence, spread, reemergence, and genotypic changes of JEV. (Résumé d'auteur)

<http://dx.doi.org/10.1371/journal.pntd.0002208> Cirad-Agritrop Dk : 570632

Articles publiés dans une revue à facteur d'impact

238

Tran, A., L'Ambert, G., Lacour, G., Benoît, R., Demarchi, M., Cros, M., Cailly, P., Aubry-Kientz, M., Balenghien, T., and Ezanno, P. (2013)

A Rainfall- and Temperature-Driven Abundance Model for #Aedes albopictus# Populations

A Rainfall- and Temperature-Driven Abundance Model for #Aedes albopictus# Populations

International journal of environmental research and public health vol.10:n°5

The mosquito Aedes (Stegomyia) albopictus (Skuse) (Diptera: Culicidae) is an invasive species which has colonized Southern Europe in the last two decades. As it is a competent vector for several arboviruses, its spread is of increasing public health concern, and there is a need for appropriate monitoring tools. In this paper, we have developed a modelling approach to predict mosquito abundance over time, and identify the main determinants of mosquito population dynamics. The model is temperature- and rainfall-driven, takes into account egg diapause during unfavourable periods, and was used to model the population dynamics of Ae. albopictus in the French Riviera since 2008. Entomological collections of egg stage from six locations in Nice conurbation were used for model validation. We performed a sensitivity analysis to identify the key parameters of the mosquito population dynamics. Results showed that the model correctly predicted entomological field data (Pearson r correlation coefficient values range from 0.73 to 0.93). The model's main control points were related to adult's mortality rates, the carrying capacity in pupae of the environment, and the beginning of the unfavourable period. The proposed model can be efficiently used as a tool to predict Ae. albopictus population dynamics, and to assess the efficiency of different control strategies. (Résumé d'auteur)

<http://dx.doi.org/10.3390/ijerph10051698> Cirad-Agritrop Dk : 569175

Articles publiés dans une revue à facteur d'impact

239

Delatte, H., Toto, C., Boyer, S., Bouétard, A., Bastien, F., and Fontenille, D. (2013)

Evidence of habitat structuring #Aedes albopictus# populations in Réunion Island

Evidence of habitat structuring #Aedes albopictus# populations in Réunion Island

PLoS Neglected tropical diseases vol.7:n°3

Arbovirus vector dynamics and spread are influenced by climatic, environmental and geographic factors. Major Chikungunya and Dengue fever outbreaks occurring the last 10 years have coincided with the expansion of the mosquito vector Aedes albopictus to nearly all the continents. We characterized the ecological (larval development sites, population dynamics, insemination and daily survival rates) and genetic (diversity, gene flow, population structure) features of two Aedes albopictus populations from distinct environments (rural and urban) on Reunion Island, in the South-West Indian Ocean. Microsatellite analysis suggests population sub-structuring Ae. albopictus populations. Two genetic clusters were identified that were significantly linked to natural versus urban habitats with a mixed population in both areas. Ae. albopictus individuals prefer urban areas for mating and immature development, where hosts and containers that serve as larval development sites are readily available and support high population densities, whereas natural environments appear to serve as reservoirs for the mosquito. (Résumé d'auteur)

<http://dx.doi.org/10.1371/journal.pntd.000211> Cirad-Agritrop Dk : 568336

Articles publiés dans une revue à facteur d'impact

240

Robin, M., Archer, D., Garros, C., Gardes, L., and Baylis, M. (2014)

The threat of midge-borne equine disease: investigation of #Culicoides# species on UK equine premises

The threat of midge-borne equine disease: investigation of #Culicoides# species on UK equine premises

Veterinary Record vol.174:n°12

There are concerns that outbreaks of exotic or novel vector-borne viral diseases will increasingly occur within northern Europe and the UK in the future. African horse sickness (AHS) is a viral disease of equids that is transmitted by Culicoides and is associated with up to 95 per cent mortality. AHS has never occurred in the UK; however, it has been suggested that appropriate Culicoides species and climatic conditions are present in northern Europe to support an outbreak. No data are currently available regarding the Culicoides species present on UK equine properties. This study demonstrates the presence of potential AHS virus vector Culicoides species on both urban and rural equine properties within the south-east UK. PCR analysis revealed that engorged members of these species contained equine DNA, proving a direct vector-host interaction. It is therefore possible that an AHS outbreak could occur in the UK if the virus were to be imported and, given the severe welfare and economic consequences of AHS, this would have devastating consequences to the naïve UK equine population. (Résumé d'auteur)

<http://dx.doi.org/10.1136/vr.102151> Cirad-Agritrop Dk : 572967
Articles publiés dans une revue à facteur d'impact

241

Guichard, S., Guis, H., Tran, A., Garros, C., Balenghien, T., and Kriticos, D. J. (2014)
Worldwide niche and future potential distribution of #Culicoides imicola#, a major vector of bluetongue and african horse sickness viruses

Worldwide niche and future potential distribution of #Culicoides imicola#, a major vector of bluetongue and african horse sickness viruses

PLoS One vol.9:n°11

We modelled the ecoclimatic niche of Culicoides imicola, a major arthropod vector of midge-borne viral pathogens affecting ruminants and equids, at fine scale and on a global extent, so as to provide insight into current and future risks of disease epizootics, and increase current knowledge of the species' ecology. Based on the known distribution and ecology of *C. imicola*, the species' response to monthly climatic conditions was characterised using CLIMEX with 109 spatial resolution climatic datasets. The species' climatic niche was projected worldwide and under future climatic scenarios. The validated model highlights the role of irrigation in supporting the occurrence of *C. imicola* in arid regions. In Europe, the modelled potential distribution of *C. imicola* extended further West than its reported distribution, raising questions regarding ongoing process of colonization and non-climatic habitat factors. The CLIMEX model highlighted similar ecological niches for *C. imicola* and the Australasian *C. brevitarsis* raising questions on biogeography and biosecurity. Under the climate change scenarios considered, its' modelled potential distribution could expand northward in the Northern hemisphere, whereas in Africa its range may contract in the future. The biosecurity risks from bluetongue and African horse sickness viruses need to be re-evaluated in regions where the vector's niche is suitable. Under a warmer climate, the risk of vector-borne epizootic pathogens such as bluetongue and African horse sickness viruses are likely to increase as the climate suitability for *C. imicola* shifts poleward, especially in Western Europe. (Résumé d'auteur)

<http://dx.doi.org/10.1371/journal.pone.0112491> Cirad-Agritrop Dk : 574384

Articles publiés dans une revue à facteur d'impact

242

Dufourd, C., and Dumont, Y. (2013)

Impact of environmental factors on mosquito dispersal in the prospect of sterile insect technique control

Impact of environmental factors on mosquito dispersal in the prospect of sterile insect technique control

Computers and Mathematics with Applications vol.66:n°9

The aim of this paper is to develop a mathematical model to simulate mosquito dispersal and its control taking into account environmental parameters, like wind, temperature, or landscape elements. We particularly focus on the *Aedes albopictus* mosquito which is now recognized as a major vector of human arboviruses, like chikungunya, dengue, or yellow fever. One way to prevent those epidemics is to control the vector population. Biological control tools, like the Sterile Insect Technique (SIT), are of great interest as an alternative to chemical control tools which are very detrimental to the environment. The success of SIT is based not only on a good knowledge of the biology of the insect, but also on an accurate modeling of the insect's distribution. We consider a compartmental approach and derive temporal and spatio-temporal models, using Advection-Diffusion-Reaction equations to model mosquito dispersal. Periodic releases of sterilized males are modeled with an impulse differential equation. Finally, using the splitting operator approach, and well-suited numerical methods for each operator, we provide numerical simulations for mosquito spreading, and test different vector control scenarios. We show that environmental parameters, like vegetation, can have a strong influence on mosquito distribution and in the efficiency of vector control tools, like SIT. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.camwa.2013.03.024> Cirad-Agritrop Dk : 570747

Articles publiés dans une revue à facteur d'impact

243

Chevalier, V., Tran, A., and Durand, B. (2014)

Predictive modeling of west nile virus transmission risk in the mediterranean basin: How far from landing?

Predictive modeling of west nile virus transmission risk in the mediterranean basin: How far from landing?

International journal of environmental research and public health vol.11:n°1

The impact on human and horse health of West Nile fever (WNF) recently and dramatically increased in Europe and neighboring countries. Involving several mosquito and wild bird species, WNF epidemiology is complex. Despite the implementation of surveillance systems in several countries of concern, and due to a lack of knowledge, outbreak occurrence remains unpredictable. Statistical models may help identifying transmission risk factors. When spatialized, they provide tools to identify areas that are suitable for West Nile virus transmission. Mathematical models may be used to improve our understanding of epidemiological process involved, to evaluate the impact of environmental changes or test the efficiency of control measures. We propose a systematic literature review of publications aiming at modeling the processes involved in WNF transmission in the Mediterranean Basin. The relevance of the corresponding models as predictive tools for risk mapping, early warning and for the design of surveillance systems in a changing environment is analyzed. (Résumé d'auteur)

<http://dx.doi.org/10.3390/ijerph11010067> Cirad-Agritrop Dk : 571753

Articles publiés dans une revue à facteur d'impact

244

Leger, E., Vourc'h, G., Vial, L., Chevillon, C., and McCoy, K. D. (2013)

Changing distributions of ticks: Causes and consequences

Changing distributions of ticks: Causes and consequences

Experimental and applied acarology vol.59:n°1-2

Today, we are witnessing changes in the spatial distribution and abundance of many species, including ticks and their associated pathogens. Evidence that these changes are primarily due to climate change, habitat modifications, and the globalisation of human activities are accumulating. Changes in the distribution of ticks and their invasion into new regions can have numerous consequences including modifications in their ecological characteristics and those of endemic species, impacts on the dynamics of local host populations and the emergence of human and livestock disease. Here, we review the principal causes for distributional shifts in tick populations and their consequences in terms of the ecological attributes of the species in question (i.e. phenotypic and genetic responses), pathogen transmission and disease epidemiology. We also describe different methodological approaches currently used to assess and predict such changes and their consequences. We finish with a discussion of new research avenues to develop in order to improve our understanding of these host-vector-pathogen interactions in the context of a changing world. (Résumé d'auteur)

<http://dx.doi.org/10.1007/s10493-012-9615-0> Cirad-Agritrop Dk : 567160

Articles publiés dans une revue à facteur d'impact

245

Stachurski, F., Tortosa, P., Rahajarison, P., Jacquet, J., Yssouf, A., and Huber, K. (2013)

New data regarding distribution of cattle ticks in the south-western Indian Ocean islands

New data regarding distribution of cattle ticks in the south-western Indian Ocean islands

Veterinary research vol.44:n°79

<http://dx.doi.org/10.1186/1297-9716-44-79> Cirad-Agritrop Dk : 572718

Articles publiés dans une revue à facteur d'impact

246

Medlock, J., Hansford, K. M., Bormane, A., Derdakova, M., Estrada-Pena, A., George, J.-C., Golovljova, I., Jaenson, T., Jensen, J.-K., Jensen, P. M., Kazimirova, M., Oteo, J., Papa, A., Pfister, K., Plantard, O., Randolph, S. E., Rizzoli, A., Santos-Silva, M. M., Sprong, H., Vial, L., Hendrickx, G., Zeller, H., and Van Bortel, W. (2013)

Driving forces for changes in geographical distribution of #Ixodes ricinus# ticks in Europe

Driving forces for changes in geographical distribution of #Ixodes ricinus# ticks in Europe

Parasites and vectors vol.6:n°1

Many factors are involved in determining the latitudinal and altitudinal spread of the important tick vector *Ixodes ricinus* (Acari: Ixodidae) in Europe, as well as in changes in the distribution within its prior endemic zones. This paper builds on published literature and unpublished expert opinion from the VBORNET network with the aim of reviewing the evidence for these changes in Europe and discusses the many climatic, ecological, landscape and anthropogenic drivers. These can be divided into those directly related to climatic change, contributing to an expansion in the tick's geographic range at extremes of altitude in central Europe, and at extremes of latitude in Scandinavia; those related to changes in the distribution of tick hosts, particularly roe deer and other cervids; other

ecological changes such as habitat connectivity and changes in land management; and finally, anthropogenically induced changes. These factors are strongly interlinked and often not well quantified. Although a change in climate plays an important role in certain geographic regions, for much of Europe it is non-climatic factors that are becoming increasingly important. How we manage habitats on a landscape scale, and the changes in the distribution and abundance of tick hosts are important considerations during our assessment and management of the public health risks associated with ticks and tick-borne disease issues in 21st century Europe. Better understanding and mapping of the spread of *I. ricinus* (and changes in its abundance) is, however, essential to assess the risk of the spread of infections transmitted by this vector species. Enhanced tick surveillance with harmonized approaches for comparison of data enabling the follow-up of trends at EU level will improve the messages on risk related to tick-borne diseases to policy makers, other stake holders and to the general public. (Résumé d'auteur)

<http://dx.doi.org/10.1186/1756-3305-6-1> Cirad-Agritrop Dk : 567851

Articles publiés dans une revue à facteur d'impact

8.5.2. Production animale et élevage

247

Faye, B., Vias-Franck, G., and Chaibou, M. (2013)

Le dromadaire profite-t-il du changement climatique ?

Le dromadaire profite-t-il du changement climatique ?

Courrier de l'Environnement de l'INRA n°63

Cirad-Agritrop : CD_PE1140; BA_PEBA841 Dk : 570365

Articles publiés dans une revue sans comité de lecture

248

Dieguez Cameroni, F. J., Terra, R., Tabarez, S., Bommel, P., Corral, J., Bartaburu, D., Pereira, M., Montes, E., Duarte, E., and Morales, H. (2014)

Virtual experiments using a participatory model to explore interactions between climatic variability and management decisions in extensive grazing systems in the basaltic region of Uruguay

Virtual experiments using a participatory model to explore interactions between climatic variability and management decisions in extensive grazing systems in the basaltic region of Uruguay

Agricultural systems vol.130

Agricultural production in "open-sky systems" such as extensive cattle ranching on natural grasslands is subject to inter-annual climatic variability and other market fluctuations. To tackle the dependency of livestock breeding on these factors, we conducted participatory modeling with cattle producers in Uruguay. The methodology consists of simulating possible scenarios to collectively evaluate the different herd management practice alternatives. In this paper, we present an Agent-Based Model built with stakeholders and designed to represent a breeding system on a typical extensive grazing area in the basaltic soils region (BR) of Uruguay. This model has three main modules: environment, biophysical and decisional sub-models. This modularity allows the conducting of virtual experiments to reveal how some herd management decisions (such as seasonal stocking rate adjustments) combined with a climatic series can result in resilience against drought periods and market movements. Long-term simulations were implemented to analyze the sensitivity of the model to key management parameters with varying climate conditions. The inter-annual climatic variability can seriously affect cattle production, even with conservative stocking rates. Rigid strategies are bound to fail and cause systems to break. Adaptive management emerged as a critical option for the sustainability of livestock breeding. The inter-annual climatic variability can seriously affect cattle production, even with conservative stocking rates. This result highlights the importance of adaptive management, one that can react to a changing environment, for the sustainability of livestock breeding. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.agryeo.2014.07.002> Cirad-Agritrop Dk : 573906

Articles publiés dans une revue à facteur d'impact

249

Berre, D., Boussemart, J.-P., Leleu, H., and Tillard, E. (2013)

Economic value of greenhouse gases and nitrogen surpluses: Society vs farmers' valuation

Economic value of greenhouse gases and nitrogen surpluses: Society vs farmers' valuation

European Journal of Operational Research vol.226:n°2

Livestock supply must challenge the growth of final demand in the developing countries. This challenge has to take into account its ecological effects since the dairy and livestock sectors are clearly pointed out as human activities which contribute significantly to environmental deterioration. Therefore, livestock activity models have to include desirable and undesirable outputs simultaneously. Using this perspective, we implement a Data Envelopment Analysis model to evaluate shadow prices of outputs under contradictory objectives between the society and the farmers. We show that farmers are able to reduce pollution significantly if society accepts to balance farmers' opportunity cost. Finally, we observe that initial levels of the CO₂ tax implemented in European countries are in line with farmers' valuation while the current level of the CO₂ tax tends to reach the value of pollution targeted by the society. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.ejor.2012.11.017> Cirad-Agritrop Dk : 567362

Articles publiés dans une revue à facteur d'impact

250

Petersen, S. O., Blanchard, M., Chadwick, D., Del Prado, A., Edouard, N., Mosquera, J., and Sommer, S. G. (2013)

Manure management for greenhouse gas mitigation

Manure management for greenhouse gas mitigation

Animal vol.7:n°2, suppl.

Ongoing intensification and specialisation of livestock production lead to increasing volumes of manure to be managed, which are a source of the greenhouse gases (GHGs) methane (CH₄) and nitrous oxide (N₂O). Net emissions of CH₄ and N₂O result from a multitude of microbial activities in the manure environment. Their relative importance depends not only on manure composition and local management practices with respect to treatment, storage and field application, but also on ambient climatic conditions. The diversity of livestock production systems, and their associated manure management, is discussed on the basis of four regional cases (Sub-Saharan Africa, Southeast Asia, China and Europe) with increasing levels of intensification and priorities with respect to nutrient management and environmental regulation. GHG mitigation options for production systems based on solid and liquid manure management are then presented, and potentials for positive and negative interactions between pollutants, and between management practices, are discussed. The diversity of manure properties and environmental conditions necessitate a modelling approach for improving estimates of GHG emissions, and for predicting effects of management changes for GHG mitigation, and requirements for such a model are discussed. Finally, we briefly discuss drivers for, and barriers against, introduction of GHG mitigation measures for livestock production. There is no conflict between efforts to improve food and feed production, and efforts to reduce GHG emissions from manure management. Growth in livestock populations are projected to occur mainly in intensive production systems where, for this and other reasons, the largest potentials for GHG mitigation may be found. (Résumé d'auteur)

<http://dx.doi.org/10.1017/S1751731113000736> Cirad-Agritrop Dk : 569309

Articles publiés dans une revue à facteur d'impact

251

Alary, V., Messad, S., Aboul-Naga, A., Osman, M. A., Daoud, I., Bonnet, P., Juanes, X., and Tourrand, J.-F. (2014)

Livelihood strategies and the role of livestock in the processes of adaptation to drought in the Coastal Zone of Western Desert (Egypt)

Livelihood strategies and the role of livestock in the processes of adaptation to drought in the Coastal Zone of Western Desert (Egypt)

Agricultural systems vol.128

Analyses of the roles of livestock in household livelihood in the context of global change and the different stresses triggered by such changes are not rare. However, the many changes that threaten the actual functioning of the systems and trigger many uncertainties concerning capacities to adapt to external shocks require new research approaches. In this paper, we explore the links between capital assets, risk perception, measure of income, and livestock adaptation using a typology value based on multiple factorial analyses. We examine the specific role of livestock in the processes of adaptation to a 15-year drought. The study is based on a farm survey of 182 Bedouin families in the Coastal Zone of Western Desert of Egypt in 2011. Our results show that livestock is still a core component of Bedouin society with a significant typology value. However, for Bedouin families located inland, livestock is mainly an economic safety net in the case of drought; whereas for family members who recently moved to town, livestock is a social safety net vis-à-vis the traditional society which enables them to

cope with economic hardship and participate in social events. How livestock is managed during drought events and the role of livestock in the process of adapting to drought depends less on the size of the herd before the drought in the rain-fed zone and more on traditional social and official networks. Consequently, limiting the impact of drought in this zone requires paying more attention to the management of collective action, including livestock policies and feed subsidies. (Résumé d'auteur)
<http://dx.doi.org/10.1016/j.agrsy.2014.03.008> Cirad-Agritrop Dk : 573525

Articles publiés dans une revue à facteur d'impact

252

Al-Saiady, M. Y., Mogawer, H. H., Al-Mutairi, S. E., Bengoumi, M., Faye, B., Musaad, A., and Gar-Elnaby, A. (2014)

Dietary and seasonal effects on body weight, ovarian development and blood reproductive hormone levels in peri-pubertal female camels (#*Camelus dromedarius*#)

Dietary and seasonal effects on body weight, ovarian development and blood reproductive hormone levels in peri-pubertal female camels (#*Camelus dromedarius*#)

Journal of Animal and Veterinary Advances vol.13:n°14

The aim of the present study was to investigate the effect of nutrition on body weight gain, ovarian development, blood components (total protein, albumen, globulin, cholesterol, glucose) and hormone (estradiol, progesterone, FSH, LH, GnRH and Leptin) levels in peri-pubertal female camels. Fourteen dromedary females (*Camelus dromedarius*) were divided into two groups (A and B) with respective average body weight and age of 381 kg, 24 months and 458 kg, 24 months at the start of the experiment. Group A received a diet with 13% Crude Protein (CP) and 2.9 Mcal Metabolizable Energy (ME). Group B received the traditional diet of the farm with 12.43 CP and 2.7 ME. Both diets contained 1:3 forage:concentrate ratio. Individual feed intake was calculated after a 14 days adaptation period. Feed offered and orts were recorded daily during the entire experimental period of 24 months. Blood samples were taken from the same 5 animals in each group at 15 day intervals throughout the experimental period. Hormone concentrations were measured using specific ELISA kits. Initial body weight, final body weight and average daily gain for the two treatment groups were not significantly different. Group B had greater ovarian size than group A but the difference was also non-significant. The size of the right ovary was less than the left ovary. Season had no significant effect on ovary's size. Group A camels tended to have higher blood estradiol, leptin, GnRH and LH levels than group B. However, the differences were not significant except in the case of estradiol. Progesterone and FSH levels were also comparable in the two groups. It was concluded that the feeding regimen used in this study did not significantly affect body weight, daily weight gain and blood progesterone level while a relative, though statistically non-significant, increase was recorded in blood estrogen, Leptin, GnRH and LH levels in group A. (Résumé d'auteur)

<http://dx.doi.org/10.3923/javaa.2014.891.896> Cirad-Agritrop Dk : 573802

Articles publiés dans une revue à facteur d'impact

253

Musaad, A., Faye, B., and Al-Mutairi, S. E. (2013)

Seasonal and physiological variation of gross composition of camel milk in Saudi Arabia

Seasonal and physiological variation of gross composition of camel milk in Saudi Arabia

Emirates journal of food and agriculture vol.25:n°8

Weekly milk samples from ten lactating she camels (*Camelus dromedarius*) were analyzed regularly for 11 months after parturition. The main values for all samples were $2.54 \pm 0.72\text{g}/100\text{g}$ fat matter, $3.07 \pm 0.30\text{g}/100\text{g}$ protein, $4.21 \pm 0.37\text{g}/100\text{g}$ lactose and $0.76 \pm 0.10\text{g}/100\text{g}$ ash. Fat content decreased from 3.41% at the first week to 2.29% at 36th week post-partum with rising at the end to 2.95% while protein decreased from 3.44% at week 1 to 2.79% at the end of lactation, and lactose from 4.48% to 3.90%. Ash increased from 0.72% to 0.82% then decreased down to 0.71%. Regarding seasonal variation, maximum level of fat was observed in January (3.46%) and minimum at summer time (2.29% in July). Protein content was maximum in February (3.32%) and minimum in October (2.76%). For lactose, the maximum mean value was 4.38% in February and the minimum in September (3.83%). The ash content was quite variable in January then stable all over the year. All components were highly positively correlated, except between fat and ash content which was not significant. No significant effect of parity, gestation length, calf body weight at birth or adult weight on all milk content. The average total milk production was 1207 L for 11 months range between 875 and 1616 L. The correlation between milk production and milk components are significantly negative. (Résumé d'auteur)

<http://dx.doi.org/10.9755/ejfa.v25i8.16095> Cirad-Agritrop Dk : 569448

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

254

Blayac, T., Mathé, S., Rey-Valette, H., and Fontaine, P. (2014)

Perceptions of the services provided by pond fish farming in Lorraine (France)

Perceptions of the services provided by pond fish farming in Lorraine (France)

Ecological economics vol.108

This article discusses a study of the perceptions of ecosystem services in pond fish farming in the Lorraine region, one of the principal pond fish farming regions in France. In total, 668 people were surveyed from four types of population: fish farmers, economic and institutional stakeholders, pond users and inhabitants of villages located close to the ponds. A typology of perceptions was established using a principal component analysis associated with an ascending hierarchical ranking. It shows differentiated perceptions of the categories of ecosystem services by population type. Age and education affect these perceptions. In addition, econometric modeling (a multinomial logit model) showed the importance of regulating and supporting systems for fish farmers, stakeholders and pond users. The preferences of local residents are more evenly spread across service categories, although it may be noted that educational level tends to increase the choice of supporting and regulating services. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.ecolecon.2014.10.007> Cirad-Agritrop Dk : 574308

Articles publiés dans une revue à facteur d'impact

255

El Mokaddem, A., Lejars, C., Benchekroun, F., and Doukkali, R. (2014)

Adaptation et conditions de formalisation des paiements pour services environnementaux pour la conservation des pâturages collectifs au Maroc

Adaptation et conditions de formalisation des paiements pour services environnementaux pour la conservation des pâturages collectifs au Maroc

Revue Marocaine des Sciences Agronomiques et Vétérinaires vol.2:n°2

Les paiements pour services environnementaux (PSE) représentent un outil d'incitation à la conservation des services environnementaux (SE) qui sont des bénéfices issus de la multifonctionnalité des écosystèmes naturels. L'adaptation des PSE et leur formalisation dans le contexte des pâturages collectifs seraient d'un intérêt capital pour les pays en voie de développement. Toutefois, cela dépend étroitement du contexte politique, économique et socioculturel en place et de son aptitude à intégrer les ajustements nécessaires. Le présent papier propose une réflexion autour des voies d'une formalisation d'un PSE adapté au contexte des pâturages collectifs au Maroc. L'intérêt des PSE est abordé, dans un premier temps, à la lumière d'une évaluation rapide de deux expériences marocaines d'incitation à la mise en défens des pâturages. Les principaux enseignements soulèvent des questions théoriques que nous avons tenté d'analyser en examinant le rôle de la rationalité économique, de l'organisation et des préférences des éleveurs concernés par ce type de pâturage dans la formulation de la décision de l'adhésion à de nouvelles règles de gestion en présence d'une incitation. Les expériences marocaines sont analysées sur la base des informations tirées d'une vingtaine d'entretiens semi-directifs réalisés auprès d'acteurs gouvernementaux et d'experts nationaux. Les résultats de nos analyses montrent un intérêt potentiel des PSE pour promouvoir la conservation des pâturages communs via une conditionnalité renforcée et socialement appropriée, et la nécessité d'une vision politique accompagnée par une redéfinition de la gouvernance et d'une échelle territoriale adaptée pour pérenniser la conservation. (Résumé d'auteur)

http://www.agrimaroc.org/index.php/Actes_IAVH2/article/view/339 Cirad-Agritrop Dk : 574002

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

256

Vall, E., Salgado, P., Corniaux, C., Blanchard, M., Dutilly, C., and Alary, V. (2014)

Changements et innovations dans les systèmes d'élevage en Afrique

Changements et innovations dans les systèmes d'élevage en Afrique

Productions animales vol.27:n°2

<http://www6.inra.fr/productions-animautes/2014-volume-27/Numero-2-2014-PP-73-176/Changements-et-innovations-dans-les-systemes-d-elevage-en-Afrique> Cirad-Agritrop Dk : 573976

Articles publiés dans une revue à facteur d'impact

257

Thevenot, A., Aubin, J., Tillard, E., and Vayssières, J. (2013)

Accounting for farm diversity in Life Cycle Assessment studies - the case of poultry production in a tropical island

Accounting for farm diversity in Life Cycle Assessment studies - the case of poultry production in a tropical island

Journal of cleaner production vol.57

The farm is the most influential stage of agricultural production because farming practices affect both pre-farm and on-farm environmental impacts. Since farm diversity is not usually taken into consideration, it is legitimate to question the interest of including it in Life Cycle Assessment (LCA) studies. This work explores several approaches to modelling the farm stage when assessing the environmental impact of an agricultural supply chain in a context with variable farm performances. A LCA of a poultry supply chain was applied from cradle-to-slaughterhouse gate. The first approach is a classical one in which farm diversity is not taken into account and an average farm is constructed on the basis of weighted average farm characteristics. The second approach distinguishes four farm types identified by cluster analysis, and four LCA were performed according to these farm types. Farm types were distinguished based on their consumption of inputs and the type of ventilation of the farm buildings. Results indicate that the classical approach is sufficient to highlight problem hotspots and to identify promising mitigation measures. Reducing the transport distance of imported maize, improving feed conversion efficiency and anaerobic digestion of slaughterhouse animal wastes were identified as appropriate mitigation measures. As feed production and poultry rearing are the stages with the most impact, distinguishing farm types provides i) insight into farm functioning to better explain the variability of environmental impacts and understand how to reduce them, ii) reduce the uncertainty of results, and iii) provide appropriate recommendations for mitigation measures. Coupling a farm typology with the LCA is particularly useful when farming systems are very diverse like in Reunion Island where the climate varies considerably across the island. (Résumé d'auteur)

<http://dx.doi.org/10.1016/j.jclepro.2013.05.027> Cirad-Agritrop Dk : 571486

Articles publiés dans une revue à facteur d'impact

258

Faye, B. (2014)

The Camel today: Assets and potentials

The Camel today: Assets and potentials

Anthropozoologica vol.49:n°2

Although it is occupying quantitatively a marginal place among the domestic herbivorous (0.4% only of the world domestic herbivorous), the large camelids (dromedary and Bactrian) are present in almost all the arid lands of the old world (except in Southern Africa), wide spread over 35 millions km². They are overall remarkable enhancer of these spaces by their productive potential and by their role in the agro-ecosystemic balance of the arid lands, especially with the current climatic changes. Elsewhere, they are known for their physiological peculiarities linked to their adaptation ability to harsh conditions of the desert and of its margin. In consequence, they represent a fabulous biological model for the scientists from different disciplines. Their place in the "modern world" has to be re-evaluated by considering these trends and these particularities. (Résumé d'auteur)

Cirad-Agritrop Dk : 574438

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

259

Ickowicz, A., Garba, I., Toutain, B., Cesaro, J.-D., Gerber, P., and Touré, I. (2014)

Plaidoyer pour un système d'information sur le pastoralisme au Sahel

Plaidoyer pour un système d'information sur le pastoralisme au Sahel

Afrique contemporaine vol.1:n°249

<http://dx.doi.org/10.3917/afco.249.0090> Cirad-Agritrop Dk : 573839

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

260

Manoli, C., Corniaux, C., Ickowicz, A., Moulin, C.-H., and Dedieu, B. (2013)

Quels rôles pour l'élevage dans la sécurisation des familles ? Une approche par les trajectoires sociotechniques dans le Ferlo sénégalais. In "Agir en situation d'incertitude en agriculture : regards pluridisciplinaires au Nord et au Sud. - Bruxelles : PIE-Peter Lang, 2013", pp. 253-274.

Cirad-Agritrop : CD_E50 ANC 16493 Dk : 569836

261

Daoud, I., Fawzi, A.-K., Saidi, S., Abdelzaher, M., Duarte, L., Tourrand, J.-F., Moselhy, N., Bastianelli, D., Hassan, F., Salama, O., Boutonnet, J.-P., Taha, H., and Martin, V. (2014)

Atlas of changes in livestock farming systems, livelihoods and landscapes of the North West coast of Egypt, CIRAD, Montpellier. 64 p.

The Mediterranean basin has faced important changes in its environment : (i) urbanization and demographic pressure on natural resources, mainly land and water; (ii) increased food demand, and changes in habit and culture, and (iii) climate. Due to strong historical and cultural links with the natural and social environment of the North Coastal zone of the Western Desert in Egypt, livestock activities hold a structural role in the social and spatial organization or land use. The exploratory ELVULMED project entitled: "Role of livestock activities in the process of adaptation and reducing vulnerability of Mediterranean societies facing global changes" aimed at : (i) analyzing and understanding the role of livestock activities in reducing the vulnerability at the family and territorial levels in the face of global change and (ii) identifying the key determinants of adaptive processes in the South Mediterranean.(Résumé d'auteur)

http://elvulmed.cirad.fr/FichiersComplementaires/Atlas_Egypt_Ver-8.pdf Cirad-Agritrop : BA_BR6898

Dk : 574806

262

Manoli, C., Ancey, V., Corniaux, C., Ickowicz, A., Dedieu, F., and Moulin, C.-H. (2014)

How do pastoral families combine livestock herds with other livelihood security means to survive? The case of the Ferlo area in Senegal

How do pastoral families combine livestock herds with other livelihood security means to survive? The case of the Ferlo area in Senegal

Pastoralism: Research, Policy and Practice vol.4:n°3

Reducing vulnerability to hazards is a major challenge for pastoral settlements in the dry lands of sub-Saharan Africa. Accumulation of a stock of living animals is a major means of livelihood security that pastoralists use to cope with their constraints, amongst which is high environmental variability. Diversification and long-distance mobility are other means of livelihood security, implying specific family organization. We analysed the combination of these means in ensuring the livelihood security of 508 familial settlements in the rural community of Ferlo, Tassekre (Senegal). At least 40% of the settlements surveyed were small pastoral families, composed of one or two households with small herds (less than 50 cows and 50 sheep). Herds were the major means of livelihood security, but due to lack of a sufficient labour and other assets, the situation of these impoverished families was very precarious. In 28% of the settlements, families combined livestock, crops and non-farming activities as livelihood means. The remaining 32% of the settlements were pastoral settlements supported by large cattle herds and, in many cases, the production of Aïd el Kebir rams (for the major Muslim religious event). Non-farming activities were also present in these settlements with large herds, especially activities in the livestock trade. Diversification can reinforce the function of herds as savings accounts and might also enable the pastoralists to invest in livestock activities. There were three groups of settlements based on the characterization of livelihood security strategies used by pastoral herders. Over time, pastoralists have to utilize several means of security to cope with climatic shocks such as droughts, and familial events such as the death of the familial chief. Family organization (dispersal or grouping), diversification and mobility are important means used to recover after major losses of animals. (Résumé d'auteur)

<http://dx.doi.org/10.1186/2041-7136-4-3> Cirad-Agritrop Dk : 572994

Articles publiés dans une revue à comité de lecture, sans facteur d'impact

263

Bommel, P., Dieguez, F., Bartaburu, D., Duarte, E., Montes, E., Pereira Machín, M., Corral, J., Pereira de Lucena, C. J., and Morales, H. (2014)

A further step towards participatory modelling. Fostering stakeholder involvement in designing models by using executable UML

A further step towards participatory modelling. Fostering stakeholder involvement in designing models by using executable UML

Journal of artificial societies and social simulation vol.17:n°1

This paper focuses on the collective design and immediate execution of an agent-based model (ABM) by dynamically interpreting the activity diagrams of agent behaviours. To reach this objective, we have implemented an ABM of livestock producers facing drought conditions in Uruguay. The first step consists in implementing a standard ABM with pasture growth, herd dynamics and simple agents roughly imitating farmers' strategies. The second step is more participative since it consists in

assessing the model with the real cattle farmers. As with most modelling processes, this evaluation phase requires feedback on model design. In order to make this assessment more lively and efficient, we have conceived a tool for drawing diagrams that can be immediately interpreted by the agents. Thanks to this new editor, the actors have quickly understood how the model worked and were able to criticize and modify it. Thus, this innovative modelling tool enables the involvement of stakeholders in co-designing ABM for participatory foresight studies. We hope it will facilitate the emergence of new and more efficient practices for farm management that can account for climate changes. (Résumé d'auteur)

<http://jasss.soc.surrey.ac.uk/15/1/10.html> Cirad-Agritrop Dk : 572359

Articles publiés dans une revue à facteur d'impact

264

(2014)

Resilience and development: mobilising for transformation, Montpellier, France/Ed. Centre pour la Communication Scientifique Directe, VilleurbanneXXXVIII-869-XLII p.

Cirad-Agritrop Dk : 574897

265

Fuentes, E., Bogue, J., Gomez, C., Vargas, J., and Le Gal, P.-Y. (2014)

Effects of dairy husbandry practices and farm types on raw milk quality collected by different categories of dairy processors in the Peruvian Andes

Effects of dairy husbandry practices and farm types on raw milk quality collected by different categories of dairy processors in the Peruvian Andes

Tropical animal health and production vol.46:n°8

In developing countries, milk quality is often mismanaged in relation to husbandry practices, collection logistics, and the production of small batches. This paper investigates how the management of milk quality from farm to dairy processor impacts on both chemical and hygienic indicators, in a context characterized by farm scale diversity, the co-existence of formal and informal markets, and high milk demand. It is based on an analysis of the chemical and hygienic quality of milk samples collected over a 12-month period from 20 farms and three dairy processors. Data from the farmers' husbandry practices and the logistics of milk collection were also collected. A large range of quality profiles and farming practices were observed. This diversity is explained by rainfall and temperature pattern, farm size which affects hygienic quality, and lack of efficient logistics between farms and dairy processors. The findings indicate that in a context of high demand for milk and poor private and public regulations, milk quality is impacted upon by poor stakeholders' management practices. (Résumé d'auteur)

<http://dx.doi.org/10.1007/s11250-014-0658-6> Cirad-Agritrop Dk : 574418

Articles publiés dans une revue à facteur d'impact

266

Lesnoff, M., Lancelot, R., Moulin, C.-H., Messad, S., Juanes, X., and Sahut, C. (2014)

Calculation of demographic parameters in tropical livestock herds : a discrete time approach with LASER animal-based monitoring data, Springer [Pays-Bas], Dordrecht. X-99 p.

Présentation de l'éditeur : Ruminant livestock (cattle, small ruminants, and camels) have a determinant economic role in many tropical developing countries. In traditional low-input farming systems, demographic parameters (e.g. reproduction or mortality rates) are important indicators for estimating and modelling herd dynamics and production, and impacts of farming practices or environmental risks (droughts, epizootics, etc.). Although such parameters have been extensively described in the literature on tropical livestock, many descriptions only rely on empirical presentations of formulas without clear methodological justifications. This book fills this gap, presenting the main concepts used to define and compute demographic parameters for tropical livestock, such as probabilities and hazard rates of occurrences and competing risks. It is based on the LASER software, a relational database management system specifically designed for animal-based monitoring surveys. It also provides an introduction on R, the free statistical software (<http://www.r-project.org>) used for the computations. It is intended for researchers, engineers, technicians, or students dealing with demographic parameters of tropical ruminant livestock in various fields such as animal science, epidemiology, or economy. It will also be valuable for readers wishing to enhance their understanding of definitions and formulas found in the literature, and it will guide them in their applications. Contents: 1. Introduction. 1.1. Background and objectives. 1.2. Animal-based monitoring. 1.3. A selection of parameters. 1.4. Organization of the handbook. 2. Grouping demographic data. 2.1. Cohort splitting. 2.2. Pseudo-cohort splitting. 3. Mortality and offtake rates. 3.1. One type of removal. 3.2. Case with

two types of removal. 3.3. Additional points. 4. Other demographic rates. 4.1. Reproduction rates. 4.2. Synthetic rates. 4.3. Global demographic rates. 5. Package Laserdemog. 5.1. R software. 5.2. Functions in Laserdemog. 5.3. Additional points. 6. Numerical examples. 6.1. Example 1 - Overall description. 6.2. Example 2 - More on reproduction rates. 6.3. Example 3 - Test of a treatment on mortality. 7. Annexes. 7.1. Rates p and h in survival analyses. 7.2. R materials. 7.3. Structure of tables generated by hsplit and vsplit. 8. Bibliography

<http://dx.doi.org/10.1007/978-94-017-9026-0> Cirad-Agritrop : CD_U10 LES 16876 Dk : 573771

9. Index

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