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**VULGARISATION DES DONNEES SCIENTIFIQUES POUR DIMINUER LA
VULNERABILITE AUX CHANGEMENTS CLIMATIQUES - STRATEGIES
D'ADAPTATION ET ETUDE DE CAS AU BURKINA FASO**

Conférence Régionale sur les Changements Climatiques et les Phénomènes Extrêmes en Afrique Sub-Saharienne, Cotonou, 6-9 Juin 2007

Dans le domaine de la recherche, de nombreuses données sont collectées. Mais le concept « changement climatique » n'entre pas toujours dans les objectifs de la recherche, ou si l'aspect est pris en compte, les données collectées ne satisfont pas les décideurs ainsi que les responsables des programmes et projets de développement. Comment pouvons-nous simplifier toutes ces informations scientifiques pour faciliter la communication avec les décideurs ? Notre étude de cas montre qu'effectivement, la traduction dans la langue des décideurs et acteurs n'est pas si difficile qu'on puisse croire. Dans le cas d'une étude sur la végétation et ses liens avec le bilan d'eau, les travaux de terrain ont été effectués dans un petit bassin versant dans la province du Sanmatenga, au Burkina Faso. Les données collectées sont des paramètres physiques du sol (infiltrabilité, texture, densité apparente, contenu en carbone et pF), d'information sur l'action de ruissellement, des descriptions des croûtes, et la cartographie sur petite échelle de la végétation et des effets de l'érosion. Les entretiens en groupe et individuels avec les habitants du village dans la zone de recherche ont complétés les données de terrain. Des prévisions climatiques prévoient que dans les années à venir, l'irrégularité et l'intensité des précipitations seront plus élevées qu'aujourd'hui. En effet, au regard de ces conditions climatiques l'action de l'eau de ruissellement augmentera également la perte des sols fertiles. Pourtant, la disponibilité de l'eau et des sols fertiles est d'une importance capitale pour la population, pour la production agricole et pour le couvert végétal. Comment vulgariser donc ces données pour une publique plus grande, spécifiquement les décideurs, les programmes et les projets de développement? A travers quelques exemples, nous allons montrer comment ces données confirment que certaines pratiques peuvent réduire la vulnérabilité des populations dans les régions semi-arides. L'infiltrabilité mesurée avec des méthodes différentes nous indique que souvent, le problème de disponibilité d'eau est lié à la formation des croûtes (horizons superficiels) sur le sol, et moins au type de sol. Si l'eau a la chance de rester sur place au lieu de ruisseler, l'infiltration est beaucoup plus profonde. Notre recommandation est d'investir plus dans les techniques de rétention d'eau, comme les cordons pierreux et les demi-lunes. La distance des arbres pris en compte dans nos expériences nous indique que l'infiltration est plus élevée à côté de ceux-ci. Lors des entretiens, la population a souligné l'importance de la végétation comme étant une brise vent. Ces deux paramètres combinés nous montrent qu'il faut investir dans un couvert végétal sain pour réduire l'érosion hydrique et éolienne. Les résultats scientifiques sont très utiles pour les décideurs ainsi que les responsables des programmes et projets de développement. Pourtant, faire le lien entre la recherche et la politique n'est pas toujours une chose aisée. Avec les exemples ci-dessus, nous avons montré que les données scientifiques peuvent être traduites avec des recommandations très claires.

Mots clés : Modélisation, Hydrologie, Ruissellement, Végétation, Changement climatique

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LES IMPACTS DES CHANGEMENTS CLIMATIQUES SUR LE BILAN D'EAU – UNE APPLICATION DE 'SOIL AND WATER ASSESSMENT TOOL' (SWAT) DANS LES ZONES SEMI-ARIDES DU BURKINA FASO

Conférence Régionale sur les Changements Climatiques et les Phénomènes Extrêmes en Afrique Sub-Saharienne, Cotonou, 6-9 Juin 2007

Les forêts sèches ont un rôle important dans les moyennes de subsistance des populations riverain des forêts. Les forêts sèches fournissent des biens et services comme la biodiversité, la régulation du cycle hydrologique, des plantes médicinales et des autres produits forestiers non ligneux. Accès à ces biens et services diminuent la vulnérabilité contre la variabilité climatique des populations. La régulation du cycle hydrologique est l'un des services fournis par les forêts. Le défi de prévoir la quantité et la qualité de l'eau disponible est plus élevé au regard des conditions instables du climat. Beaucoup de documents ont été élaborés sur les forêts tropicales humides, mais seulement peu est connu concernant le rôle des forêts dans la régulation du cycle hydrologique dans les environnements semi-arides, spécifiquement en l'Afrique de l'Ouest. Dans cette région, une utilisation permanente de l'eau, spécialement pendant la longue saison sèche, est d'une importance capitale pour la population. L'eau peut être disponible comme l'eau souterraine et dans les régimes fluviaux comme débit de la saison sèche. Pour cette raison, il y a un besoin solide d'obtenir une meilleure connaissance des influences de la végétation sur le bilan d'eau, particulièrement sur la recharge de la nappe et le débit dans la saison sèche, dans différentes zones climatiques. Une approche scientifique juste et rigoureuse permet d'identifier les stratégies appropriées pour l'adaptation aux changements climatiques. L'outil SIG 'Soil and Water Assessment Tool' (SWAT) est utilisé pour évaluer les impacts des changements climatiques sur le bilan hydrique. Le model indique comment les changements du ruissellement et de l'infiltration affectent la quantité et la qualité du bilan d'eau à l'échelle des bassins versants. Les principales données pour fournir le modèle sont les données météorologiques, les débits, les occupations de terre et les paramètres physiques du sol. Les résultats préliminaires montrent que dans l'avenir l'irrégularité et l'intensité des précipitations donneront des records de débits plus élevés ('peaks of discharge') dans la saison pluvieuse, et par conséquent une baisse de la disponibilité en eau pendant la saison sèche. En effet, au regard de ces conditions climatiques, la charge du sédiment augmente également, en affectant la qualité d'eau. Actuellement les données entrant sont bien réglementées pour la perfection et la précision des résultats prévus. Les résultats sont utiles pour la politique des forêts sèches et leur mode de gestion, mais également pour les décideurs dans le domaine de la gestion intégrée des ressources en eau. En outre, cette information sera utilisée pour générer des critères en vue d'une évaluation de la vulnérabilité des écosystèmes des forêts sèches et des communautés dépendant de la forêt en général.

Mots clés : Modélisation, Hydrologie, Ruissellement, Végétation, Changement climatique

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IMPACTS OF CLIMATE CHANGE ON THE WATER BALANCE - AN APPLICATION OF THE SOIL AND WATER ASSESSMENT TOOL (SWAT) IN SEMI-ARID BURKINA FASO

SWAT2007 Conference, Delft, The Netherlands

Regulation of the hydrological cycle is one of the services provided by forests. The challenge to predict the quantity and quality of water availability is greater under changing climatic conditions. Much has been documented in humid tropical forests, but only a little is known concerning the roles of forests in regulating the hydrological cycle in semi-arid environments, especially in West-Africa. In this region a sustainable water supply, especially during the long dry season, is of importance to the population. Water can be available as shallow groundwater and as dry season flow in river systems. The Soil and Water Assessment Tool (SWAT) has been used to assess the impacts of climate change on the water balance. The model indicates how runoff and infiltration changes affect the water balance quantity and quality at a catchment level. The main data inputs for the model are meteorological data, river discharge, land use and soil physical parameters. Preliminary results demonstrate that erratic and intensive rainfall leads to higher peaks of discharge in the rainy season, and consequently a decline of water availability during the dry season. Under such climatic conditions the sediment load also increases, affecting the water quality. Input parameters are now being fine-tuned to improve the accuracy of predicted outputs. Results are useful for dry forest policy and management options. Moreover, this information can be used to generate criteria for vulnerability assessment of dry forest ecosystems and the forest-dependent community.

Keywords: Modelling, Hydrology, Runoff, Vegetation, Uncertainty, Land use, Climate change, Sahel, West Africa

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ASSESSING THE IMPACT OF CLIMATE CHANGE ON THE WATER BALANCE IN SEMI-ARID WEST AFRICA: A SWAT APPLICATION

Florian Probst and Carsten Keßler (Eds.): GI-Days 2007 - Young Researchers Forum. p. 309 – 312.

IfGIprints 30. ISBN: 978-3-936616-48-4. Short paper for GIDays conference in Germany

Full paper available <http://gi-tage.de/downloads/acceptedPapers/verbeeten.pdf>

The paper discusses the application of the Soil and Water Assessment Tool (SWAT) in the evaluation of climate change impacts on hydrological services provided by dry forests and savannah ecosystems in Burkina Faso, West Africa. Preliminary results demonstrate that erratic and intensive rainfall leads to higher peaks of discharge in the rainy season, caused by relative reduction in infiltration and an increase in surface runoff. This results in a decline of water availability and less groundwater recharge. Under such climatic conditions the sediment load also increases, affecting the water quality. Input parameters are now being fine-tuned to improve the accuracy of predicted outputs. Especially input parameters have posed problems. In a country like Burkina Faso often data are not readily available, which requests a considerable effort to construct a database with all required data for the SWAT model. Data that are available often lack appropriate metadata, such as projection info, application scale and other important information. Especially the soil data posed a serious problem, having a French classification system that had to be translated into the FAO classification. Subsequently, input parameters requested for SWAT had to be derived for each soil type. This increased the uncertainty of input parameters considerably. Also, although general river discharge data are available, no discharge data exist from the watershed. These data had to be derived from nearby locations. Although general trends are clear now and qualitative conclusions can be drawn, the quantitative impact of climate change yet has to be established. This can only be done after proper evaluation of the input data, establishment of the influence of errors in the datasets and amelioration of the input data. However, the first results are promising and SWAT seems to be an appropriate tool to evaluate the impacts of climate change on the water balance.

Keywords: Modelling, Hydrology, Runoff, Vegetation, Uncertainty, Land use, Climate change, Sahel, West Africa

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DROUGHT-PRONE COMMUNITY-BASED NATURAL RESOURCE MANAGEMENT IN SUDAN

Managing Drought and Water Scarcity in Vulnerable Environments: Creating a Roadmap for Change in the United States (18–20 September 2006, Longmont, Colorado State)
Geological Society of America

The forest cover area in the Sudan decreased from 30% in 1990 to 26% in 2000. The survival of Sudan's natural resources has become a land use, natural vulnerability and a socio-economic issue. This study focuses on Smallholder farmers (SHFs) who cultivate on small parcels of land and also depend on natural resources crucial to their survival. This study probed for data, surveys and views that provided a link between drought/desertification and the utilization and management of natural resources on one hand, and the impacts on livelihoods and the environment on the other. The principal objective of the study was to assess the level of involvement of SHFs on the adoption of forestry practices and to examine the role of natural resources critical to livelihood strategies during drought. A cross-sectional survey was conducted with SHFs from two villages in Kosti province viz; Gadid and El Mileah through interviews using questionnaires, group and focus group discussion and Participatory Learning and Action (PLA) methodology. Descriptive statistics was used to analyze the data collected. The results of the study revealed that, drought limits plant growth and the productivity of natural resources. However, most SHFs have adopted a range of management strategies through an integrated land use practice to ensure improved yields.

Keywords: Drought, Farmer, Livelihood, Sudan

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**TROPICAL FORESTS AND CLIMATE CHANGE: AN ADDITIONAL DIMENSION IN
SUSTAINABLE FOREST MANAGEMENT**

*Regional Workshop on Sustainable Forest Management in West Africa
November 12-21 2007, Conakry, Guinea*

Forests ecosystem goods and services is at the centre of climate change adaptation and mitigation (REDD and CDM) activities. However, majority of forest managers and decision makers in West Africa have limited knowledge on the connection and contribution of forests in reducing the impacts of climate change. This paper highlights the role of forests in responding to climate change impacts. It also recommends that any initiative on sustainable forest management should integrate climate change aspects.

Keywords: Forest, Policy, Climate change, Mainstream, Mitigation, Adaptation

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NATIONAL FOREST POLICIES AND THE PROVISIONING OF ECOSYSTEM GOODS AND SERVICES FOR ADAPTATION TO CLIMATE CHANGE IN WEST AFRICA

Climate Change: Science and Solutions 8th National Conference on Science, Policy and the Environment January 16-18, 2008 Washington, DC

In Sub-Saharan Africa, the reliance on forest ecosystem goods and services for livelihood is pivotal for adaptation to climate change. Climate impacts are already affecting the flow of these goods and services, threatening livelihoods and national development efforts as well as amplifying the vulnerability of poor communities. This review paper examines the current forest policies of Ghana and Burkina Faso in their constraints and opportunities in the flow of resources for adaptation of the forest-dependent communities to climate change impacts. A comparative analysis of the current forest policies and their intervention strategies reveal that both climatic and non-climatic factors such as tenure rights which determines resource accessibility, and also forest resource management strategies shape autonomous adaptation responses of poor communities to climate change. In Ghana, the management policy of forest reserves restricts community access to non-timber forest products while in Burkina Faso in the contrary the policy provides access rights to community in forest reserves. These disparities in national forest policies could influence community potential for adaptation to climate impacts in the region.

Keywords: Forest policy, Adaptation, Climate change, Forest products, West Africa

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WATER SCARCITY UNDER A CHANGING CLIMATE IN GHANA: OPTIONS FOR LIVELIHOOD ADAPTATION

Paper submitted to 'Development' special issue on "Water for People" (2008: Volume 51.1)

The effects of climate change and variability on water availability in Ghana is already being felt throughout the country. Coping with water scarcity thus becomes a major issue.

Current analysis of communities in the River Offin basin indicates they are rural with no pipe-borne water, and predominantly farmers who depend on irrigation for their crops. The basin also provides the communities with water for drinking and for other economic activities. With the extent of dependence on rainfall and rivers for water needs, and the climate situation expected to worsen in the coming years, livelihoods in Ghana's watersheds are at risk. As a result, this paper examines options for livelihood adaptation.

Keywords: Climate change, Variability, Water scarcity, Livelihood, Offin basin, Adaptation

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**LIVELIHOODS AND TROPICAL FORESTS VULNERABILITY AND ADAPTATION TO
CLIMATE CHANGE IN WEST AFRICA**

*Abstract of Background paper presented at the West African first meeting of partners of the
Tropical Forests Climate Change Adaptation (TroFCCA) project
June 7–8 2006, Ouagadougou, Burkina Faso*

As climate change impacts continue to be expressed in West Africa through recurrent droughts, intermittent floods, reduced precipitation and increased temperature, livelihood vulnerability increases. Forests play major roles in the provision of livelihood goods and services for majority of the population but they are sensitive to climate variability. Deforestation, bush fire, and fragmentation practices further increases forest vulnerability which intends exacerbate livelihood vulnerability. This paper highlights the linkages between livelihoods and forests vulnerabilities for adaptation to climate change in West Africa.

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**LINKAGES IN LAND USES AS LANDSCAPE MOSAICS FOR CLIMATE CHANGE
ADAPTATION IN THE WEST AFRICAN SAHEL**

*Earth System Science Partnership (ESSP) Open Science Conference
9-12 November 2006. Beijing, China*

Fragmentation of the West African dry forest for livelihood activities like cropping, pastoral practices, logging and woodfuel harvest, have resulted in biodiversity loss, foregone ecosystem services and resilience, thus exacerbating the vulnerability of the region to climate change impacts. The lack of planned adaptation strategies could result in mass migration of people and livestock, increased poverty, and food insecurity with the potentials of generating other social crises extending beyond the region.

This study reviewed the opportunities in integrating multiple land uses commonly occurring as patches on the landscape but used for livelihood activities into a comprehensive climate change adaptation plan, which allows for mutual coexistence of sectors and stakeholders, and enhanced resilience of the ecosystem. Results indicate that organised transhumance activities like the systematic grazing of harvested crop fields, or the use of forest woodlands for animal browsing and shades, offer mutual benefits to the sectors involved, and constitute major adaptation strategy. In this framework, enhancing the capacity of stakeholders in managing cross-sectoral activities provides for diversification of alternative household income sources, nutritional security, soil fertility improvement, operational and transport assistance (draught power). Further dialogue and policy frameworks would establish better balances in livestock carrying capacity and transhumance activities in avoiding conflicts and other forms of land degradation which could increase vulnerability.

Keywords: Land use, Climate change, Adaptation, Landscape, Sahel

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FOREST PLATFORM FOR CLIMATE CHANGE ADAPTATION IN WEST AFRICA

*International Conference on the reduction of vulnerability to climate change of natural, economic and social systems in West Africa. Ouagadougou, Burkina Faso 24-27 January 2007
Organised by United Nations Economic Commission for Africa (ECA)
Session: Prospects for West Africa*

As a common resource pool providing affordable resources for over 80% of the population in West Africa, tropical forest play multidimensional roles in poverty alleviation and for climate change adaptation as drivers and providers of household livelihoods and national development opportunities. Incidentally, forest receives very little attention in national planning and policy dialogues. Besides the unfavorable climate predictions, current and predicted rates of deforestation, land degradation and over-exploitation of NTFP of foods and medicinal plant extracts, will further exacerbate livelihood vulnerability to climate change impacts in the region. This paper highlights the roles of tropical forests for climate change adaptation, and the development of adaptation strategies for forest-linked livelihood sectors (of bioenergy, water, NTFP of foods and medicinal) which must be mainstreamed into policies. The study undertaken under the Tropical Forest Climate Change Adaptation (TroFCCA) project is part of a global initiative also in Asia and Central America. In West Africa, the project is implemented in Mali, Burkina Faso and Ghana under the Center for International Forestry Research (CIFOR). Working with stakeholders across local, national and regional levels, TroFCCA - West Africa has successfully initiated a regional policy dialogue platform on climate change adaptation, which has jointly identified and prioritized highly vulnerable forest-based sectors of importance to household livelihoods and national development. The elaboration of methodologies for vulnerability assessments of the selected sectors, and the provision of training opportunities and capacity building for students, researchers as well as policy-makers in adaptation and utilization of climate information are other important achievements of the project so far.

Keywords: Forest, Climate change, Adaptation

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**INTEGRATING LANDSCAPE PATTERNS IN CLIMATE CHANGE ADAPTATION
PLANNING IN THE WEST AFRICAN SAHEL**

*2007 International Union of Biological Sciences
May 8-13 2007, Washington, DC*

The Sahel is regarded as a fragile ecosystem partly due to its geographic location and exposure to contrasting climatic conditions, which exacerbates its vulnerability to perturbations. Human activities especially through land use and land cover change (e.g. cropping, livestock grazing, irrigation, woodfuel harvesting etc) have significantly altered and fragmented the sahelian landscape into mosaics of patchy vegetation of grassland interspersed with scattered shrubs and trees, and in some cases surrounded by bare patches and deeply eroded gullies. The fragility of the modified landscape easily amplifies vulnerability and imposes additional constraints to human adaptive capacity to climate impacts. Some of the observed climate impacts include prevalent droughts, frequent dust and wind storms, and intermittent flooding during the short period of rainfall during the months of July and September. All these contribute to the problem of food security, water availability, healthcare problems etc. Migration, transhumance and other form of relocation have constituted coping strategies in the past. However, under increasing demographic changes and other institutional constraints, there are needs to develop other mechanisms for adaptation. This paper highlights landscape contribution to climate change vulnerability and the need for integrating landscape patterns in adaptation planning. Integrating the matrix of land uses commonly used for livelihood activities on the landscape into a comprehensive climate change adaptation plan, would expand coping opportunities and allows for mutual coexistence of sectors and stakeholders. Organized transhumance activities for example through systematic grazing of harvested crop fields, or the use of forest woodlands for animal browsing and shades, offer multiple benefits from integrated land uses beneficial for adaptation. A policy framework is however, crucial in establishing better balances in land use carrying capacity and avoiding conflicts and other forms of land degradation which could increase vulnerability.

Keywords: Forest, Climate change, Adaptation, Land use, Landscape, Sahel

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FOREST FOR SYNERGY IN GLOBAL CHANGE RESPONSES IN THE CENTRAL AFRICAN REGION

*Central Africa, Cameroon and global change
Colloque international 6 au 8 juin 2007 à Yaoundé, Cameroun*

Cameroon together with other countries in the Central African region face similar global change challenges like other parts of the world, with the risk of limiting future development and erasing previous developmental efforts. Climate change has emerged as an important global challenge which requires urgent response under a unified effort irrespective of the disproportionate responsibilities to the root causes. In spite their insignificant contribution to the global carbon emission, developing countries accounts for a greater proportion of the 17 % of the global carbon emission attributed to deforestation. The Stern Report released late last year, together with the fourth IPCC report released in February 2007, emphasizes the impending risk Sub Saharan Africa face from climate impacts. Furthermore, the Global Forest Outlook released in March 2007, indicated that in spite of the global reduction, deforestation is still increasing in Sub Saharan Africa with Cameroon and Zaire among the leading countries in deforestation. As a common resource pool providing affordable resources for over 80% of the population in Central Africa, tropical forest play multidimensional roles in poverty alleviation and for climate change response as drivers and providers of household livelihoods and national development opportunities. Incidentally, forest receives very little attention in those perspectives in national planning and policy dialogues. This paper highlights the roles tropical forests can play for climate change response for both mitigation and adaptation, and in the development of renewable energy strategies for the region especially under the global advocacy for a shift from fossil fuel. The study undertaken under the Tropical Forest Climate Change Adaptation (TroFCCA) project is part of a global initiative also in Asia and Central America. In West Africa, the project is currently implemented in Mali, Burkina Faso and Ghana under the Center for International Forestry Research (CIFOR) with plans to expand in the Congo Basin forest. Working with stakeholders across local, national and regional levels, TroFCCA - West Africa has successfully initiated a regional policy dialogue platform on climate change adaptation, which has jointly identified and prioritized highly vulnerable forest-based sectors of importance to household livelihoods and national development. The elaboration of methodologies for vulnerability assessments of the selected sectors, and the provision of training opportunities and capacity building for students, researchers as well as policy-makers in adaptation and utilization of climate information are other important achievements of the project so far.

Keywords: Forests, Climate change, Mitigation, Adaptation, Synergy

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MANAGING FOR CONSERVATION OF BIODIVERSITY, SOIL CARBON STORAGE AND THE PROVISION OF OTHER ECOSYSTEM SERVICES ALONG CLIMATIC GRADIENTS IN WESTERN AFRICA

Global Carbon Project Conference, Kruger National Park, South Africa, August 2007

Studies of carbon sequestration (related to global warming) and biodiversity (tied to agricultural productivity, ecosystem resilience, general environmental health, etc.) are key features of scientific inquiry into human livelihood and environmental safety in all regions of the world, and are now widely seen as two highly important forms of what has been termed “ecosystem services.” Advancements can be made towards these ends by integratively quantifying key factors known to affect soil carbon storage and biodiversity. Studying such trade-offs in the provision of services is particularly poignant in Western Africa, where both resource limitations and (in some areas) land pressures are severe. It is crucial that integrative research and quantitative models on ecosystem service indicators be generated to relate biodiversity, carbon, and land use on multiple scales, to provide the necessary information to managers, and to create better linkages between remote sensing models and the locally gathered information of ecologists, sociologists, agronomists, etc, so that such problems can be addressed. This research consortium will extend current individual partner studies on vulnerability, carbon sequestration, and ecological assessment of ecosystem services. An international research team from Spain, Burkina Faso, and Togo will carry out soil carbon budget assessments at sites spanning the longitudinal climatic gradient of West Africa, each site representing distinct floristic regions and rainfall zones. At each site, soil carbon, plant productivity, biodiversity, and community structure will be assessed for a number of land use types. In this way, researchers will integratively assess the relationships between climatic factors, land use and land cover change, diversity affects, and soil organic carbon storage. It would also be noted that within this model there exists great potential to perform additional assessments for other environmental factors, ecosystem services, and indicators of ecosystem and livelihood vulnerabilities.

Keywords: Soil carbon, Biodiversity, Ecosystem service trade-offs, Ecosystem services, Modeling, Ecosystem resilience

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**USING TROPICAL FOREST ECOSYSTEM GOODS AND SERVICES FOR PLANNING
CLIMATE CHANGE ADAPTATION WITH IMPLICATIONS FOR FOOD SECURITY AND
POVERTY REDUCTION**

Invited Presentation at the 35th Anniversary Symposium of ICRISAT 22-24 November 2007

Tropical forest ecosystems represent a common heritage with livelihood portfolios shared by a great majority of people especially in developing countries but are now threatened by climate change. In spite of their contribution to poverty alleviation and food security, and also for climate change responses (adaptation and mitigation especially through the market-incentive schemes (CDM) of the Kyoto Protocol) forests are still hardly integrated into national planning processes aimed at addressing any of these national development challenges. This is evident in some of the national documents of some developing countries such as the Poverty Reduction Strategy Paper (PRSP) to the World Bank, and the First National Communication to UNFCCC. This paper presents some preliminary outcomes of the Tropical Forests and Climate Change Adaptation (TroFCCA) project of the Center for International Forestry Research (CIFOR) whose overall mission is to underscore the importance of tropical forests for livelihood adaptation to climate change and mainstreaming adaptation into national development processes. The paper also highlights TroFCCA's approach in engaging stakeholders from the onset in setting the agenda with the identification and prioritization of forest-based sectors as the entry point in the process of assessing the vulnerability to climate change and developing adaptation strategies for these selected development sectors. This is a highly crucial area with great policy implications. Planning with ecosystem goods and services seems to emerge as a prospective approach to demonstrate to policymakers the potential of forest ecosystems for livelihood adaptation to climate change which also enhances the opportunity for achieving food security and community resilience to poverty. TroFCCA's approach in engaging stakeholders at the onset in defining their perception of ecosystem goods and services by virtue of their importance to household livelihoods and their contribution to national development emphasizes the significance of a place-based context in the valuation of ecosystem goods and services. This approach also contributes to raising public and policy awareness to climate change as part of the continuum of mainstreaming climate change adaptation into national development planning. The study also highlights the opportunities that an ecosystem approach provides for integrated natural resource planning for achieving co-benefits linked to the realization of two (1 and 7) important Millennium Development Goals. However, there are other policy and institutional reform challenges including governance, equity and rights to resources that need to be addressed in order to reap the full suite of benefits for climate change adaptation, poverty reduction and food security.

Keywords: Forest, Ecosystem services, Climate change, Poverty, Adaptation, Food security

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CLIMATE CHANGE PROJECTIONS FOR WEST AFRICA

*Abstract of Background paper presented at the West African first meeting of partners of the Tropical Forests Climate Change Adaptation (TroFCCA) project
June 7–8 2006, Ouagadougou , Burkina Faso*

Naturally occurring variability and changes in climate over West Africa need to be taken into account in assessing the vulnerability of the region to potential impact of climate change due to green house gas emissions. As research on climate change and its possible impact on different sectors of the economy and livelihood, a better understanding of West Africa projected climate is indispensable. Regional-level climate models for West Africa are currently inadequate to make future projections of temperature and rainfall with any precision. Nevertheless, several studies have ascertained that the region will either become hotter and wetter or hotter and drier by 2050 and beyond as a result of global warming, the magnitude, distribution and timing of these changes are not predictable and calls for further investigation.

Keywords: Climate change, Projections, Variability, Climate models, Global warming

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SCIENCE FOR DEVELOPMENT- POLICY BROKER OR IVORY TOWER

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Full paper available: <http://www.tropentag.de/2006/abstracts/full/527.pdf>

Policymaking is a complex process influenced by a multitude of factors and effects which are not always transparent, and is executed by policy makers who do not always act rationally. Following the concept of evidence-based policymaking, science and research (S&R) should inform policy makers in such a way that the process of policymaking is rational, rather than opinion-based. However, the existence of evidence alone is not a guarantee that it will inform policy makers, as shown by today's realities in developing (as well as in developed) countries. Besides fulfilling quality standards such as credibility, problem specificity, solution orientation, and communicability, the given evidence has to be placed into the policy process which consequently, demands more action on the side of S&R institutions. Often, it lacks of formal or informal information channels and linkages between S&R institutions at national and international levels, and with other actors in the policy arena. Additionally, existing linkages are not fully used. This paper presents network analysis as a tool to identify relevant actors, and the existing or missing paths and channels among them. It uses a case study in Burkina Faso as an example and examines the reasons for success and failure in efforts for evidence-based policymaking. The analysis is based on results of a two-year research on policy networks in Burkina Faso (2001–2003). In particular, the role of an independent agricultural research network (focusing on land policy) will be examined. Its role as a policy broker in the arena of natural resource management indicates the importance of active networking to communicate scientific evidence, even though manifold obstacles are present, and the potential of such organisations is still not fully used. The results show that network analysis can be a useful tool to support S&R's role (and responsibility) as a policy broker to avoid inaccessible ivory towers full of evidence.

Keywords: Science-Policy dialogue, Evidence-based Policymaking, Policy Network Analysis, Burkina Faso

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MAINSTREAMING FORESTRY-RELATED CLIMATE CHANGE ADAPTATION STRATEGIES INTO POLICY - THE TROFCCA PROJECT APPROACH -

Regional conference on climate change in Sub-Saharan Africa, June 6th to 9th 2007, Cotonou, Benin

Climate Change impacts on countries' and regions' ecological, economic and social development are of growing concern in public and in policy, especially as highlighted in the new IPCC report presented in Paris earlier this year. The new IPCC report states that African countries will be most affected by future climate change, since among other factors, widespread poverty, institutional constraints, and inadequate political strategies are significant limitations to the local adaptive capabilities. Development policies in the affected countries are challenged to formulate and implement adequate adaptation strategies and set development priorities under current and predicted climate changes. Such strategies may counteract the local population's vulnerability to climate change and maintain tropical forests' ES (Environmental Services) for the global community. Science can play a fundamental role in the policy arena, as it can identify adaptation strategies, and can inform the policymakers about opportunities to minimise the risk of further vulnerability of the population through recommending possible adaptation strategies to future climate scenarios. However, it is well-documented that policymaking is not always solution-oriented and evidence-based. Also scientific research does not always fulfil quality criteria like credibility, solution-orientation as well as in-time delivery, etc. As a research project TroFCCA (Tropical Forests and Climate Change Adaptation) faces the challenge of how to mainstream identified adaptation strategies into policy. The dynamics of use and management of natural resources like forests highly vary within the region as does the institutional environment. The policy arena itself is dominated by a multitude of stakeholders (e.g. actors of the (inter)-governmental, non-governmental, and private sector) who act at multiple layers from the local to the global level. In this context, TroFCCA has chosen a policy-science dialogue-oriented approach rather than offering technocratic solutions. In a first step, stakeholders of three West African countries (Burkina Faso, Ghana, Mali) have decided in which forestry sectors the project should emphasise its research activities (Water, Bioenergy, NTFPs like fodder resources). Vulnerability assessments combining bio-physical and socio-economic approaches related to the three identified development sectors taking place and adaptation strategies will be identified. Evidence gained by these research activities will be translated into policy. Consequently, the political content as well as the structure in the respective policy arenas needs to be analysed. Implemented policies and programs as well as the local institutional environment relevant to the identified sectors will be evaluated to identify political and institutional obstacles or needs for successful adaptation. A multi-stakeholder analysis will accompany the entire research process. Network analysis is chosen as a method to identify the structures, gaps and bridges in the varying policy arenas. The TroFCCA methodological framework enables a mainstreaming of identified adaptation strategies into policy by (1) the identification of bottlenecks in ongoing political processes and programs which affect vulnerability, and (2) by the identification of potential paths and brokers to assist in mainstreaming. Science itself and scientific networks in the region can act as policy broker and make use of path opportunities to ensure that the results gained by inter-disciplinary research are translated into policy.

Keywords: Climate change, Adaptation, Policy analysis, Policy Networks, Forest ecosystem Goods and Services, West Africa

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**THE ROLE OF GOVERNANCE IN CLIMATE CHANGE ADAPTATION:
UNDERSTANDING AND MANAGING THE INTERFACE BETWEEN INDIVIDUAL &
INSTITUTIONAL RESPONSES**

*Paper presented at the “Workshop on a Global Change Research Network in African Mountains”
Makarere University in Kampala, Uganda from 23-25 July 2007*

Global change, with its different faces and appearances, induces transformations of economies, societies and ecosystems. Populations rely on a host of ecosystem goods and services, whose management and use tends to be mediated by human motivations at the individual level and systems of governance at the collective level. In the face of exogenous change of critical significance to local livelihoods, human behaviors – mediated by human motivations and collective rules – interface with a new set of dynamics which defy prior experience and expectations. Institutions of governance, an important co-determinant of human behavior, are a product of unique historical processes as well as of expected patterns in the natural world (ecosystem structure, function and dynamics; market dynamics; etc.). When those patterns change in unexpected ways, an array of new vulnerabilities sets in unless these institutions and other triggers influencing adaptive behavior can be adapted to new realities. This adaptation hinges on learning at diverse levels, and feedbacks between levels, to equitably distribute risks and opportunities and facilitate information flows related to both – thus enabling informed responses at individual and institutional/group levels.

The paper pulls from the literature on resilience, social network analysis and common property resources to posit important components of resilience and adaptive governance in the context of climate change. It then builds upon these concepts to analyze current institutions of governance in socio-ecological systems of east and West Africa. In each case study, the properties of governance are highlighted and contrasted with factors known to enhance adaptive capacity, and implications for climate change adaptation are drawn. Key governance challenges are identified and implications for future research highlighted. The paper concludes with a discussion of research contributions that can help to strengthen learning for improved adaptive capacity of individuals and institutions in the context of climate change and variability.

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**FORESTRY-RELATED DEVELOPMENT POLICIES AND CLIMATE CHANGE
ADAPTATION – THE TROFCCA PROJECT APPROACH TO A SCIENCE -
POLICY DIALOGUE**

Paper presented at the ECPR conference 6-8 September 2007, Pisa, Italy

Full paper available: http://www.ecpr.visionmd.co.uk/paper_info.asp?paperNumber=PP1043

Climate Change effects on countries' and regions' ecological, economic and social development are of growing public and political concern. The IPCC report states that African countries will be most affected by future climate change. Widespread poverty, institutional constraints, and inadequate political strategies are significant limitations to local adaptive capabilities. Development policies in the affected countries are challenged to formulate and implement adequate adaptation strategies and set development priorities to counteract the local population's vulnerability to climate change. Science can play a fundamental role in the policy arena as it can inform the policy process about evidence on adaptation strategies. However, it is well-documented that policymaking is not always solution oriented and evidence-based. Also research projects do not always fulfil quality criteria like credibility, solution-orientation, in-time delivery, etc. TroFCCA (Tropical Forests and Climate Change Adaptation) faces the challenge of how to identify and mainstream adaptation strategies into development policy in West Africa. The policy arena itself is dominated by a multitude of stakeholders who act at multiple layers from the local to the global level. In this context, TroFCCA has chosen a policy science dialogue-oriented approach rather than offering technocratic solutions. Stakeholders of three West African countries have decided (to ensure ownership, commitment) in which forestry sectors the project should emphasise its research activities. Sector policy analyses and vulnerability assessments will be conducted. Network analysis is chosen as a method to identify the actors, paths, gaps and bridges in the policy arenas. The TroFCCA methodological framework enables mainstreaming of adaptation into policy. Science itself can act as policy broker and make use of path opportunities to ensure that the results gained by inter-disciplinary research are translated into policy.

Keywords: Adaptive Capacity, Science-Policy Dialogue, Evidence-based Policymaking, Policy Network Analysis, Burkina Faso

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DECENTRALIZATION - WINDOW OF OPPORTUNITY FOR SUCCESSFUL ADAPTATION? A CASE STUDY FROM BURKINA FASO

Paper submitted and accepted for the Tyndall conference “Living with climate change: Are there limits to adaptation” conference, 7-8 February 2008

In West Africa, livelihoods of the population highly depend on forest ecosystem goods and services (FES), often in interplay with the agricultural and livestock production systems. To reduce the growing risk of vulnerability under Climate Change technical and societal adaptation is needed. Governance structures are challenged to set a frame for a formulation and implementation of adaptation strategies at multiple layers. With the current decentralization process in Burkina Faso, the institutional landscape is changing, administration and local governance are reorganized, and a transfer of resources to the local municipalities is ongoing. Preliminary results from a comparative pilot research show opportunities and obstacles for adaptation in this changing institutional environment. Comparative research focusing on governance, forests and adaptation was undertaken in two municipalities in the Southwest of Burkina Faso. In-depth interviews were conducted with actors from government, municipalities and the environmental, agricultural, and animal production extension services. The interviews covered role of forests for livelihoods; perception of, experience with, and scenarios for CC; needed individual, organizational and political responses; roles and responsibilities for adaptation of the different actors in the arena, including their networks of information and influence regarding the topic. In the arena of local governance and climate change, trade-offs between investments in agricultural productivity aims and sustainable forest management were obvious even if the informants highlighted the interdependence and the cooperative potential between agricultural, livestock, and forestry sector. Consequently, their prioritization of the sectors led to a prioritization of adaptation needs. Knowledge about adaptation measures, at individual and organizational level, and efforts for implementation varied between the sectors, along with differing provision of resources (financial/human). Knowledge was seen as key factor for both success (e.g. investments in community forests) and failure (e.g. sold-off of a Teak forest) in the municipalities' recent past. New allies and partnerships have been formed in the changing governance structure. Particularly agents of the environmental service approached proactively the newly introduced decentralized structures. Different 'mental models' were identified. Informant's risk perception and perceptions of the necessary qualities of a 'good adapter' or an 'adaptive organization' often led to different individual preferences of action for adaptation. Most informants preferred information or incentive options over pressure and coercion as policy responses adequate to realize adaptation at multiple layers. These results indicate that successful adaptation is strongly driven by actors' personal motivation, depending - among other factors - on awareness, risk perception, and knowledge (e.g. about impacts of CC, technical adaptation measures, and on potential incentives schemes (e.g. PES)). Two key features of governance are essential for technical and societal adaptation to Climate Change: (1) institutional capacities and willingness for learning; and (2) institutional flexibility, ensured by short distances to local realities. Decentralization offers strong opportunities for design and implementation of adaptation strategies due to growing institutional flexibility, higher responsiveness, and selective planning and implementation at local level. However, success can be hindered by lack of learning capacities, lack of knowledge and a biased agenda setting for adaptation due to perceived trade-offs among the various sectors.

Keywords: Climate Change, Adaptation, Decentralization, Policy Analysis, West Africa, Forest Ecosystem Goods and Services

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**CLIMATE CHANGE, GOVERNANCE AND THE ROLE OF SCIENCE AND RESEARCH-
THE TROFCCA PROJECT APPROACH**

Paper submitted and accepted for presentation at the International Conference of the Social-Ecological Research Programme on the Human Dimensions of Global Environmental Change: Long-Term Policies: Governing Social-Ecological Change in Berlin, 22 - 23 February 2008

In West Africa, livelihoods of the population depend highly on forest ecosystem goods and services, often in interplay with the agricultural and livestock production sectors. To reduce the growing risk of vulnerability under Climate Change technical and societal adaptation is needed. Governance structures are challenged to set a frame for a formulation and implementation of adaptation strategies at multiple layers. In changing institutional landscapes, e.g. induced by ongoing decentralization processes like in Burkina Faso and Mali, new windows of opportunity for adaptation occur. Science/ Research can be an important relais to ensure and support the development of successful adaptation strategies at different levels. Through more efforts in rigorous research to identify drivers for successful or failing governance structures at multiple layers Science/Research can facilitate the design of adaptation strategies formulated by a learning and flexible governance system. To achieve this, bio-physical and socio-economic evidence needs to be combined with an analysis of content, structures and paths in a specific policy arena to support successful processes of change and adaptation. The TroFCCA approach combines a) rigorous research in the assessment of vulnerability, particularly the adaptive capacity of the system, and the responses needed with b) actions to facilitate processes of design and implementation of adaptation strategies for a sustainable development in a multi-layer governance structure. In Burkina Faso, a pilot ‘policy action research’ (in-depth interviews, focus group discussions) is ongoing since 2007. It seems that the analysis of structures and content in specific policy arenas can assist in identifying feasible paths for mainstreaming adaptation into policy, and it animates simultaneously an improvement of adaptive capacity in the researched system itself by the provision of forums for reflection. This research design allows TroFCCA to work on both key obstacles in this science-policy context simultaneously: inappropriate science and/or mal-adaptive policy processes.

Keywords: Climate Change, Adaptation, Governance, Forest Ecosystem Goods and Services, Science-Policy Dialogue

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**WOMEN LIVELIHOOD SUPPORT, FOOD SECURITY IN SUB SAHARAN AFRICA UNDER
A CHANGING CLIMATE: A ROLE FOR WOMEN IN SCIENCE AND TECHNOLOGY**

*Paper presented at the African Regional S&T Meeting on Women in Science for Food and Nutrition
Security in Africa, Entebbe, Uganda, 3-7 July 2006*

Women bear a major responsibility for ensuring household food security in Sub Saharan Africa, yet the issue of gender have been largely played down or taken for granted in popular discourse about the potential impact that climate variability and change would have in the region. Climate variability and change would and do have impact on ecosystem functions, particularly on food and agricultural sectors, thus the livelihoods support systems that majority of women in Africa play a key role, Climate change connotes the long term changes in climate as a consequence of the atmosphere being altered by natural and human activities, particularly the emission of green house gases (GHG) into the atmosphere. Conversely, climate variability usually refers to the abrupt seasonal differences in climatic variables, leading to disruption in normal human and ecosystems functions. During the 21st century, the earth is projected to continue warming by between 1.4°C and 5.8°C as a result of increasing concentrations of greenhouse gases (GHGs) and aerosols in the atmosphere (IPCC, 2001). The natural ecosystem, particularly those providing livelihood support resources for millions of people in Sub Saharan Africa are also predicted to be among the most vulnerable ecosystems to changes in temperature and rainfall. The presently observed drought, deforestation, desertification, forest land conversion, loss of biodiversity, etc, in the region will likely worsen by adverse change in temperatures and rainfall. Climate change and variability poses a major challenge to the social and economic wellbeing of women who are the force behind future food security in Africa and particularly Sub-Saharan African. It is widely documented that the negative effects of climate change are likely to hit the poorest in poorest countries the hardest. That is to say, the poorest, majority of whom are women are the most vulnerable group to climate variability and change. Sub-Saharan African, where women are highly dependent on natural resources, women livelihood and future food security is therefore likely to be inexplicably vulnerable under a changing climate. Although gender differentiated vulnerability and impact are not fully known, this paper is a call for a focus on the emerging issues of how climate change will affect the livelihood of women in agriculture and the role women in science and technology could play to enhance food security in the region in the context of changing climate. These also calls for responsive science and technology aimed at mitigation or adaptation strategies, for advocacy at national and international levels, for policies and measures that are more gender sensitive in future planned adaptation measures.

Keywords: Women, Climate change, Natural ecosystem, Livelihood, Food security

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**THE IMPLICATIONS OF GLOBAL ENVIRONMENTAL CHANGE ON WEST AFRICAN
INDIGENOUS FOREST HEALTH SERVICES**

The ESSP Open Science Conference, 9-12 November 2006. Beijing, China

Global environmental change and forests are intrinsically linked. Changes in global climate are stressing forest ecosystems through increased temperatures, altered precipitation patterns and extreme weather events. Forests play major roles in providing health services to about 75% of people in West Africa, in the form of traditional medicine and over 25% of modern medicines are made from forest plant extracts, besides the recent shift towards alternative medicines which are also forest products. In Ghana, Mali, Burkina Faso for example, the first line of treatment for 60% of children with high fever resulting from malaria is the use of herbal medicines at home. However, with global environmental changes, some of the very important indigenous forest species used in the past for healing ailments have disappeared from the forest and will continue to do so if action is not taken to preserve these forest species from adverse effects of global environmental changes. The primary health in West Africa particularly in the Sahel, already more susceptible to natural hazards and too poor for alternatives is likely to suffer under the burden of global climate change impacts. Hence, the objective of this study is to better understand the impacts of existing and anticipated global environmental changes and the corresponding vulnerability of the health sector on the people that directly depend on it.

Keywords: Environmental change, Indigenous, Forest, Medicine, Vulnerability

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ASSESSING THE VULNERABILITY OF FOREST ECOSYSTEM GOODS AND SERVICES TO CLIMATE CHANGE IN WEST AFRICA.

The International conference for reduction of vulnerability to Climate Change of Natural, Economic and Social Systems in West Africa, 24th – 29th January 2007, Ouagadougou, Burkina Faso

West Africa forests Ecosystem provides livelihood support resources for millions of people in the region. It is also of fundamental importance to environmental functions and sustainability. Numerous goods and services critical to individual and societal survivals are provided by the forest. Conversely, the ability of forest ecosystems to continue to provide these goods, services and other functions is partly determined by climatic conditions and other human interventions. Climate variability and change is recognized as a key threat to the survival of species and the reliability of the forest ecosystems world-wide. Rainfalls patterns and mean temperatures characterize the type of forest and their ultimate ability to provide a range of good and services. Viewed against the best presumption ‘yet debatable’ projections for the 21st century of the Inter governmental Panel on Climate Change (IPCC) for global mean temperature of 2° C to 6° C over the next century, the dependability on forests as provider of goods and services for livelihood support in poor countries looks bleak. The high variability and uncertainty in regional projections for rainfall, accompanied with periodic episodes of drought and desertification in the West Africa region do not paint a rosy picture of the future either. The importance of vulnerability assessment of the forests ecosystems can thus be taken seriously, first for the lack of common methodological grounds around the concept in the scientific community, and secondly for the promise it holds as a concept for analyzing ecosystems sustainability and hence for operationalizing adaptation strategies. Sustainability science in this case, spotlights an understanding of human-environmental condition with the aim of meeting societal needs while sustaining the ecosystem. The increasing recognition by policy makers and scientists of the need for adaptation to climate change, the recent provisions in the UNFCCC to assist those countries that are thought to be most vulnerable and least able to adapt underscores the timeliness of forests ecosystem vulnerability assessment, as well as the vulnerability of others forest dependent sectors that are important in national economic development. Even though vulnerability and adaptation are considered urgent issues in West Africa, most efforts in the region are concentrated on agricultural and water sectors, with less or no emphasis on forests ecosystems in spite of their importance to livelihood and the economy. This is clearly reflected in the regions’ national communication document. In view of this limited importance attached to forest ecosystem analysis and therefore possible adaptation plans, Tropical Forest and Climate Change Adaptation (TroFCCA) studies aims to contribute to the development of methodologies for understanding the vulnerability of forest ecosystems and forest related sectors, as well as identify relevant adaptation measures for forest ecosystems in the face of changing climate.

Keywords: Climate Change, Vulnerability assessment, Forest ecosystem, Livelihood, Sustainability, adaptation

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ADAPTING WATERSHEDS TO CLIMATE CHANGE AND VARIABILITY IN WEST AFRICA. THE CASE OF OFFIN RIVER BASIN IN GHANA

*The Third International Conference on Climate and Water,
Helsinki, Finland, 3-8th September, 2007*

Available at <http://www.environment.fi/deafault.asp?contentid=251148&ian=en>

Climate change and its potential impact remains a fundamental issue for sustainable development in the next decades in Africa. In developing nations, where per capita demand for natural resources is fast rising due to several reasons, the need to develop and mainstream adaptation measures into national development strategies, particularly for economies that depends almost entirely on natural resources for economic growth and sustainability is imperative. The Offin watershed located in Ashanti region of central Ghana have for decades played critical role in livelihood sustainability both for urban and rural communities. The provision of water resources (portable water, fresh fish etc) for consumption even to large cities, recreational activities, navigation and manufacturing are just a few of these functions. There is also the provision of other forest goods and services for the short term wellbeing of the communities around the watershed. Recent observations reveal a decreasing rainfall amount with a skewed distribution pattern, increased temperature and rapid destruction of the riparian forest around the watershed, resulting in considerably alteration in ecosystem functions in the past three decades. The region's economic future will therefore depend on how well the ecological system and the ecosystem functions of the watershed are adapted or respond to potential threats from climate change impact. The degree of vulnerability of the watershed and its dependent communities to climate change and variability is not clearly understood. How this ecological system will be altered has not been studied and documented, making it difficult to propose any future adaptation strategies. Hence, the primary goal of this study was to contribute to the processes of adaptation to climate change through the assessment of vulnerability of the watersheds and its dependent communities. This paper examines rainfall and temperature patterns in the River Offin basin and assesses the vulnerability and adaptation options of the River Offin and its community to climate change and variability.

Keywords: Climate change, Livelihoods, Vulnerability, Water catchment, Adaptation

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WATER OUTLOOK IN THE WEST AFRICAN SAHEL UNDER A CHANGING CLIMATE

Paper submitted to 'Development' special issue on "Water for People" (2008: Volume 51.1)

Water is life but highly threatened in the Sahel with continuous alterations in quantity and quality. Water is prominent among the MDG's but its realization is complicated by climate change and other pressures, with the potential of degenerating into regional conflicts and forceful migration. IPCC Fourth Assessment Report emphasizes the risk Africa faces with ~75-250 million people predicted to go under water stress by 2020 as the continent gets drier under climate impacts. This paper highlights the vulnerability of current water harvesting and retention strategies and explores interventions through forest-base adaptation strategies in combination with other best practices in response to climate change.

Keywords: Sahel, Forest, Climate change, Adaptation, Water catchments, Development

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DESERTIFICATION, CHANGEMENT CLIMATIQUE ET FORET DANS LE SAHEL

*Abstract of background paper the West African first meeting of partners of the Tropical Forests Climate Change Adaptation (TROFCCA) Project
June 7 - 8th 2006, Ouagadougou, Burkina Faso*

La population sahélienne en majorité rurale (environ 80%), dépend des ressources forestières pour la satisfaction de ses besoins sociaux de base, surtout pendant les périodes de famine ou de sécheresse (CGIAR, 2006). Les scénarios climatiques prédisent pour le Sahel une augmentation de la température et une baisse ou augmentation des précipitations suivant les zones (MECV, 2006). En effet, on assistera à une augmentation de la fréquence des phénomènes extrêmes tels les sécheresses et de la pression anthropique sur les ressources forestières du fait de l'accélération et de l'amplification de la dégradation des terres dues aux sécheresses, même si actuellement beaucoup de débats scientifiques ont lieu sur les possibles liens entre la sécheresse et la désertification et entre la sécheresse et les changements climatiques au Sahel. Notons cependant que l'importante fréquence des sécheresses ces dernières années au Sahel sont des manifestations du changement climatique même si certains auteurs l'attribuent à un phénomène naturel. Ces sécheresses parmi tant d'autres facteurs, exacerberont la dégradation des terres (désertification) en les rendant vulnérables à l'érosion éolienne et hydrique, par l'augmentation de l'évapotranspiration au niveau du sol, toutes choses qui entraîneront une baisse de la productivité agricole. En retour, la désertification augmente l'effet de serre à cause de l'augmentation de l'albédo des sols. Il existe donc une relation de cause à effet entre changement climatique et désertification. Parmi les conséquences de cette baisse de la productivité et de la dégradation des terres nous pouvons citer l'augmentation des pressions sur les ressources forestières par les communautés rurales qui en dépendent le plus pour améliorer leurs revenus monétaires, une augmentation des migrations vers les zones plus clémentes pour acquérir de nouvelles terres agricoles par défrichage, etc. C'est au vu de l'importance de la menace que constitue la désertification, que l'assemblée générale des Nations Unies a déclaré l'année 2006 comme année internationale des déserts et de la désertification (Granich, 2006). Ce document présentera d'abord un bref aperçu de la contribution du secteur forestier au développement économique et à la lutte contre la pauvreté en prenant le Burkina Faso comme exemple de pays sahélien, ensuite nous présenterons la Convention des Nations Unies de lutte Contre la Désertification et la Convention Cadre des Nations Unies sur les Changements Climatiques de même que le lien qui existe entre changement climatique et désertification et enfin quelques bonnes pratiques de lutte contre la désertification et leurs rôles dans la lutte contre les effets néfastes des changements climatiques et dans l'adaptation seront présentes.

Keywords: Désertification, Changement climatique, Forêt

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**EVALUATING THE SENSITIVITY AND DROUGHT TOLERANCE OF SORGHUM
(*SORGHUM BICOLOR* (L.) MOENCH) BASE ON ROOTING AND SEEDLING VIGOR
CRITERIA**

ESSP OSC, Beijing 9-12 November 2006, China

Millets and sorghum are major staple foods representing 80% of Sahel's cereal production. Productivity has, however, been declining in the last 25 years because of climate variability primarily drought. In spite of the importance of plant roots in soil water uptake and transfer to the shoots, very few studies have actually addressed these potentials in breeding programs for plant adaptation to drought partly because of lack of reliable selection criteria. This study aimed at identifying root criteria as indicators of seedling vigor and to investigate whether sorghum tolerance or sensitivity to drought could be revealed by its rooting system or seedling vigor using "logiciel whinrhizo". Randomized complete block design was used with two factors: water at two regimes (maximum evapotranspiration and stressed condition), and crop variety (3 tolerant and 3 non-tolerant) with four replications. Root length, area, mean diameter, volume, leaf water potential and plant height were measured. All the three tolerant varieties and one sensitive variety had longer root length, wider root area, better seedling vigor, and high leaf water potential in drought conditions than the other two sensitive varieties. Diameter and root volume were not different between the tolerant and sensitive varieties. There was a positive correlation between vigor and root system, notably in root length and area. However, the only sensitive variety which had the best vigor showed that this criteria was not appropriate in discriminating tolerance and sensitivity to drought. Tolerance to water deficit is an expression of balance development between the shoots and roots.

Keywords: Sorghum, Drought, Vigor, Seedling stage

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POURQUOI ET COMMENT INTEGRER L'ADAPTATION AUX CHANGEMENTS CLIMATIQUES DANS LES POLITIQUES NATIONALES DE DEVELOPPEMENT ?

*Conférence Internationale sur les Changements Climatiques, Ouagadougou, 24-27 Janvier 2007
Mise en œuvre de la Convention Cadre des Nations Unies sur les Changements Climatiques en
Afrique de l'Ouest, et Adaptation aux changements climatiques*

Le secteur primaire joue un rôle socio économique très important en Afrique de l'Ouest mais est très vulnérable aux changements climatiques. La mise en œuvre des stratégies d'adaptation réussies s'impose. Cela nécessite que ces dernières soient intégrées dans les politiques nationales de développement. C'est l'un des objectifs de notre projet Adaptation des Forêts Tropicales au Changement Climatique. Le concept « intégration de l'adaptation dans les politiques » décrit l'intégration des politiques et mesures d'adaptation pour adresser le changement climatique dans les activités de développement en cours. Cela permet d'assurer la durabilité des investissements à long terme en réduisant la sensibilité des activités de développement au climat d'aujourd'hui et de demain. Si on veut atteindre les Objectifs de Développement du Millénaire dans beaucoup de secteurs et réduire la pauvreté, l'intégration de l'adaptation dans les politiques, stratégies et actions devrait être systématique. C'est dans ce cadre que la CCNUCC recommande aux pays en voie de développement signataires de la convention d'élaborer des PANA. Pour aboutir à l'intégration de l'adaptation dans les politiques il y'aurait deux approches complémentaires: locale et sectorielle. L'approche locale favorisera une implication massive des communautés dans les processus de prise de décision autour de leurs leaders traditionnels de façon à ce que les stratégies de développement au niveau décentralisé soient soutenues. L'approche sectorielle consistera à identifier les impacts et les stratégies d'adaptation sur les secteurs clés de développement en milieu rural. Ces deux approches permettront de réviser les politiques et législations anciennes au niveau décentralisé et national pour une intégration de l'adaptation dans les politiques.

Mots clés : Adaptation, Intégrer, Changement climatique, Politique, Développement

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LA FORET COMME POLE D'ENTREE POUR L'ADAPTATION DE MULTI-SECTEURS DE DEVELOPPEMENT AUX CHANGEMENTS CLIMATIQUES EN AFRIQUE DE L'OUEST

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Du fait des nombreux biens et services que l'écosystème forestier procure, il subit d'énormes pressions anthropiques qui, en plus des conditions climatiques contribuent à réduire les surfaces forestières d'année en année. L'Afrique de l'Ouest a perdu à peu près 1,2 millions d'hectares par an depuis 1990, ce qui représente environ 24% de la déforestation annuelle en Afrique. Les tendances montrent une exacerbation de la situation aux horizons futurs à cause de l'augmentation de la population, de la paupérisation et des effets néfastes attendus des changements climatiques. Les écosystèmes forestiers déjà dégradés par plusieurs années de sécheresse et d'intenses activités anthropiques, risquent d'être davantage fragilisés par les impacts des changements climatiques, augmentant ainsi la vulnérabilité des communautés et des systèmes économiques dans la sous région. La forêt devrait donc être un pôle d'entrée pour l'adaptation aux changements climatiques puisqu'elle transcende tous les secteurs de sources de revenus et protège d'autres écosystèmes, tout en constituant une barrière naturelle contre la chaleur accablante, les tempêtes de poussières, les crues éclairées, l'avancée du désert et de la sécheresse qui sont des exemples courants d'effets climatiques enregistrés dans la région. Cependant dans les pays en Afrique de l'Ouest, le rôle des forêts dans les activités d'adaptation aux changements climatiques s'avère insignifiant. Le projet TroFCCA exécuté en Afrique de l'Ouest à travers le Centre de Recherche Forestière Internationale (CIFOR) couvre Burkina Faso, Mali et Ghana. Ses principaux objectifs sont d'évaluer les vulnérabilités des biens et services des écosystèmes forestiers aux impacts des changements climatiques, proposer des stratégies d'adaptation et les faire prendre en compte dans les politiques de développement dans la sous région. TroFCCA considère la forêt comme un écosystème composé de plusieurs secteurs jouant des rôles importants dans le développement national plus qu'un secteur d'exploitation de bois. Les secteurs prioritaires de recherche de TroFCCA incluent l'alimentation et la santé à travers les produits forestiers non ligneux, le secteur de bioénergie à travers le bois et le charbon de bois et le secteur de l'eau à travers les bassins versants. A travers la forêt, il est donc possible d'atténuer la vulnérabilité de nombreux secteurs et des communautés aux impacts des changements climatiques, mais aussi d'intervenir dans la mitigation des gaz carboniques qui sont reconnus comme étant les principaux émanant des activités humaines et jouant un rôle majeur dans le processus de réchauffement climatique global actuel. A travers ce projet, le CIFOR entend donc contribuer aux processus PANA et à l'élaboration des deuxièmes communications nationales en cours dans la région à travers un dialogue politique régional et la sensibilisation.

Mots clés: Adaptation, Forêt, Développement, Changement climatique