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Fuel wood exploitation and its implication in the Fako-Meme forest region of Cameroon

The paper focuses on the problem of fuel wood exploitation and its implications in the Fako-Meme Forest Region. It investigates the underlying causes that have led to an alarming rate of fuel wood exploitation. The Fako-Meme Region of Cameroon lies within a geographical area surrounded with the most fertile soils that are conducive for the luxuriant growth of vegetation. However, under the current practices like the anarchical exploitation of fuel wood, forests are experiencing the highest rates of depletion and degradation. The study used the Standard Social Science methodology of data collection, data analysis, interpretation and discussion. The study has been based on field observation within the Fako-Meme Forest Region with the use of questionnaires and semi-structured interviews with focussed group discursions. They survey utilized six villages based on their proximity to the forest. A total of 220 questionnaires were distributed for administration in these villages. The findings reveal that the root causes of fuel wood exploitation are diverse as well as its implications, but poverty amongst other factors is the main drive to fuel wood exploitation in the region. Since a hungry man is an angry man, they have undermined the deeper strains and implications caused to the environment. The paper finally posits some strategic guidelines for the sustainable use of fuel wood based on an integrated approach to resource management.
Key words: Fako-Meme Cameroon, human impacts, fuel wood exploitation, landscape transformation, deforestation.

Мотто Т.М.Н. Последствия использования древесного топлива в лесном регионе Фако-Меме, Камерун. Принимая во внимание тот факт, что окружающая среда – это важная система жизнеобеспечения, которая включает в себя всё что нужно для поддержания жизни людей, ее состояние часто зависит от поведения тех, кто ей пользуется. Тем самым, мы, как люди, имеем возможность либо оберегать, либо уничтожать то, что природа выращивала в течение длительного времени. Ухудшение состояния окружающей среды, вызванное нерациональным использованием природных ресурсов, оказывает крайне негативное воздействие на окружающую среду. Поэтому очень важно создать баланс между выживания человека и защитой окружающей среды. Эта статья посвящена изучению эксплуатации древесного топлива и сопутствующих последствий в лесном регионе Фако-Меме. Рассмотрено интенсивность использования древесного топлива, воздействие использования топливной древесины и исследованы адаптивные стратегии коренных народов в целях повышения устойчивого использования древесного топлива. Составлены рекомендации для директивных органов по предотвращению ситуации, прежде чем она выйдет из-под контроля. Это можно сделать только через практическую реализацию долгосрочного решения кризиса топливной древесины в районе исследования.
Ключевые слова: Фако-Меме, Камерун, антропогенное воздействие, эксплуатация древесного топлива, трансформация ландшафта, вырубка леса.

Мотто Т.М.Н. Наслідки використання деревного палива в лісовому регіоні Фако-Меме, Камерун. Беручи до уваги той факт, що навколишнє середовище – це важлива система життєзабезпечення, яка включає в себе все, що потрібно для підтримання життя людей, її стан часто залежить від поведінки тих, хто нею користується. Тим самим, ми, як люди, маємо можливість або оберігати, або знищувати те, що природа вирощувала протягом тривалого часу. Погіршення стану навколишнього середовища, викликане нераціональним використанням природних ресурсів, вкрай негативно впливає на навколишнє середовище. Тому дуже важливо створити баланс між виживанням людини і захистом навколишнього середовища. Ця стаття присвячена вивченню експлуатації деревного палива і супутніх наслідків у лісовому регіоні Фако-Меме. Розглянуто інтенсивність використання деревного палива, вплив використання паливної деревини та досліджено адаптивні стратегії корінних народів в цілях підвищення сталого використання деревного палива. Складені рекомендації для директивних органів щодо запобігання ситуації, перш ніж вона вийде з-під контролю. Це можна зробити тільки через практичну реалізацію довгострокового вирішення кризи паливної деревини в районі дослідження.

Ключові слова: регіон Фако-Меме, Камерун, антропогенний вплив, експлуатація деревного палива, трансформація ландшафту, вирубка лісу.

The increasing use of fuel wood in developing countries remains a tropical issue. The utilization of fuel wood in the sub-Saharan African accounts for 60-95 percent of the national energy [6], with the highest proportions registered in the heavily indebted poor nations [10]. This estimate reduces to 25 to 60 percent in middle-income countries, and less than 5 percent in high-income countries as revealed by [9]. According to the view of [19], fuel wood exploitation is predicted to have very draconian impacts on the environment since the shortages are will have a negative effect on farming systems.

A number authors have highlighted the implications of the over exploitation of fuel wood as a source of fuel in Cameroon. The contribution of [3] reveals that the supply of fuel wood from forests accounts for over 60% of the energy consumed and has been increasing at a rate of 2.5% per year since 1974-1976. According to the findings of [4 & 20, the demand for fuel wood increased significantly as incomes plunged with the economic crisis and following the doubling in price of traded fuels after the 1994 devaluation. These studies have focussed on the socio-economic impact without taking into consideration the ecological impacts which accompanies fuel wood exploitation. The exact rate of deforestation in Cameroon is unknown, as much of what exists is based on estimates. On a general note, deforestation rate estimates in Cameroon range from 80,000 to 200,000 hectares per year according to [13]. According to the findings of [7] there is a loss in dense moist forest cover in Cameroon of between 800 km^2 and 1 000 km^2 per year. According to FAO, the annual average deforestation rate in Cameroon for the 1980–1995 periods was 0.6% or a loss of close to 2 million ha as cited by many international organizations (WRI, UNEP, UNDP and World Bank, 1998 all in [7] with fuel wood as one of the major drivers. After a review from diverse authors, it is exceedingly that there is much rhetorics as concern fuel wood exploitation and its implications on resource base management.

In the time past the forest-adjacent communities of the Fako-Meme forest region rarely fell trees for fuel use. Their main sources of fuel wood were trees around their immediate surroundings, outside the forest, and within agricultural landscapes. Today, with changing socio-economic conditions, population growth, urbanization and its attendant problems and inadequate supply of other alternative sources of fuel like natural gas are the common vices that have overturned the clock [11]. Life is now very difficult for most people of the forest-adjacent communities in this region. Above all, added to their dependence on a single crop cultivation (cocoa) with just a single harvest only help to complicate their poverty situation [8]. To ride of this situation they are forced to make us of the resources at their disposal. The deforestation of the forest with the attendant problems of resource degradation, environmental mutation in the wake of a rapidly changing climate is another cause for alarm. How can we at this period in the 21^{st} Century address the fuel wood related problems in Cameroon? How can we establish a balance between local livelihood and environmental sustainability? Are the forest-adjacent communities going to live on Spartan conditions in order to protect the environment? These questions and others vises are the basis of that this paper is going to address in order to provide some proposed sustainable management strategies to the forest-adjacent communities of the Fako-Meme Forest Region of Cameroon.

Location of study area. The Fako-Meme Forest Region is located in the South West Region of Cameroon. Geographically, it lies between Latitude 3^o 86``–$5^o$ 4`` N and Longitude 9^o 28``– $9^o$ 49`` E, covering a surface area of 4999.80Km^2. According to the

International Convention for the Conservation of Nature this forest meets the status of a High Conservation Value Forest with closed to 60 percent of the territory under protected forest.

Consequently, 83% and 96% (Fig.1) of the total and rural population of

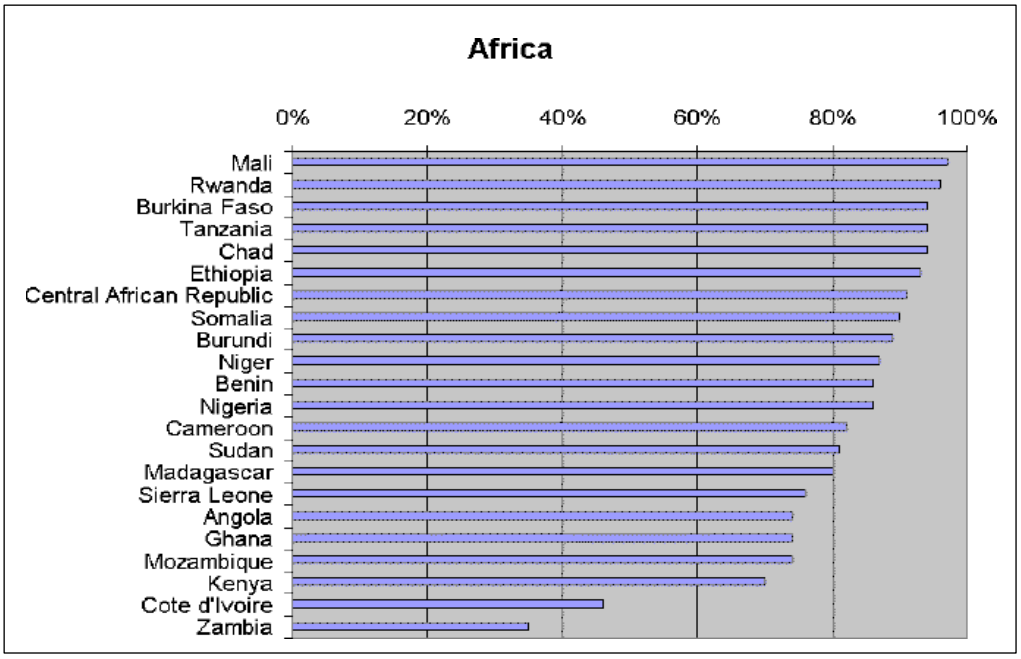

Fig. 1. Fuel wood consumption in Africa [5]

Cameroon respectively depends on fuel wood and charcoal as the principle cooking fuel. The fuel wood and charcoal market have thus been considered as the largest forest products market in terms of physical volume of timber felled [12].

The use of fuel wood in the Fako-Meme Forest Region is catalysed by the drying of fresh cocoa beans with the use of cocoa drying ovens.

The result from our field survey revealed that the main energy sources for heating in the study area according to responses from respondents are shown in Table 1.

Table 1.

Main sources of energy in the study area

Main energy source	Frequency	Percentage
Fuel wood	213	96.82
Cooking gas	2	0.91
Fuel wood/cooking gas	5	2.27
Total	220	100

With 96.82% of the randomly sampled population in the study area are using fuel wood as their main source of heating, it is very obvious that the exploitation of fuel wood for heating is a major contributor of deforestation in the study area. Just 0.91% makes use of cooking gas and 2.27% of the sampled population make use of both.

Since about 75% of the region is curved as protected areas, a handful of the forest-adjacent communities' collect their fuel wood from these reserves (Table 2).

98.11% confirms that they collect fuel wood from state reserves while 0.91% confirmed their collection from the community land and from purchase respectively.

Table 2.

Source of fuel wood provision

If fuel wood	Frequency	Percentage
State reserve	216	98.18
Community land	2	0.91
Purchase	2	0.91
Total	220	100

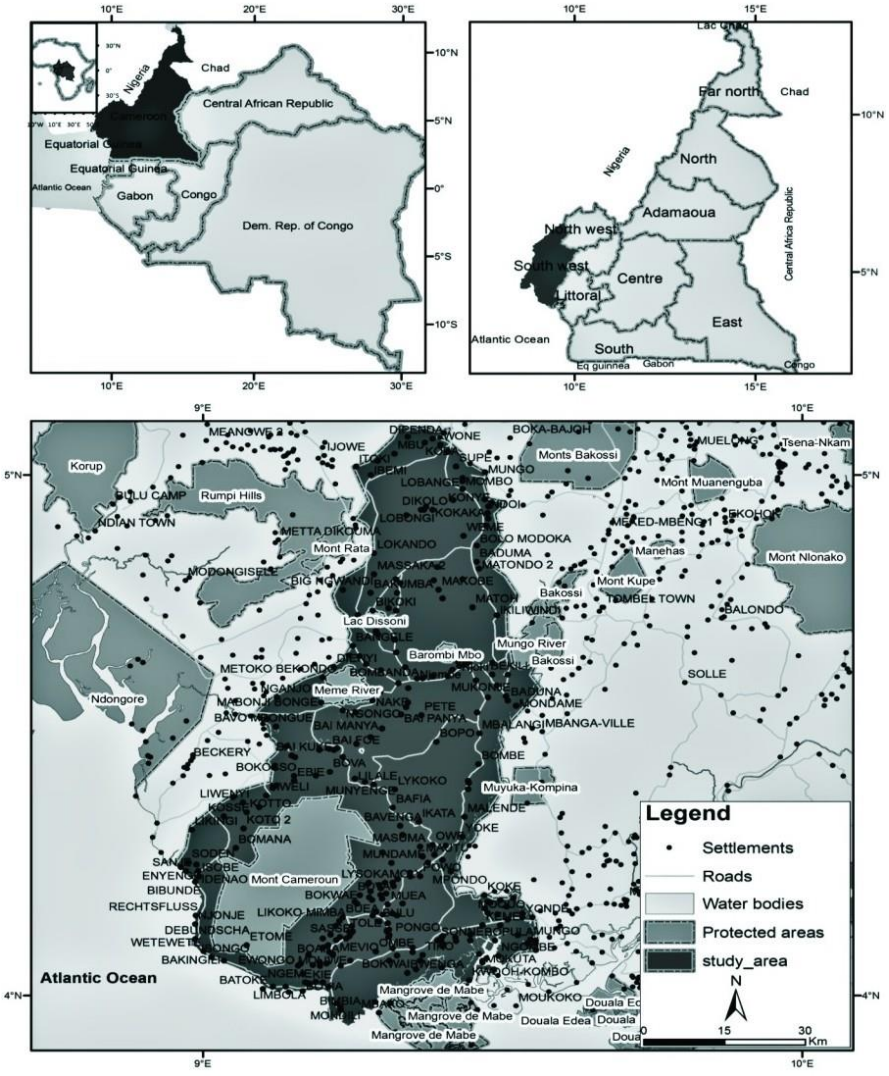

Fig. 2. Map of the Fako-Meme Forest Region of Cameroon

This wood is used for cooking in their homes, baking and drying of fresh cocoa beans before marketing.

Implication of Fuel Wood exploitation in Fako-Meme. *Defforestation.* The major implication of fuel wood exploitation in this region is loss of biodiversity. This region has registered a great loss in its forest cover orchestrated by the anarchical exploitation of fuel wood. This has equally been boosted with increase in population growth.

The rate of forest loss between 1980-1995 with an average rate of forest loss of 42.48% in the Fako-Meme forest region of Cameroon, is an indication that this region is witnessing a very high rate of deforestation and bio-degradation [2]. Taking into

Table 3.

Rate of Forest Loss Between 1980-1995

REGION	RATE OF FOREST LOSS %
FAKO	54.98%
MEME	29.98%
AVERAGE	42.48%

Fig. 3. Fuel wood exploitation in the Mangrove Zones of Tiko

consideration the fact that this activity is carried out all year round it therefore contributes to forest degradation and a substantial loss of biodiversity. If this continues unabatedly the end result will be increased in deforestation.

Fig. 4. Fuel wood Exploitation in Kombone Town

Increase in Price of Fuel wood. From Figure 3, a log of wood here cost 1000 FCFA, (2 dollars). Fuel wood is sold in logs for the drying of fresh cocoa beans and the baking of bread and cakes which is a very common practice by the forest-adjacent communities. This increase in the price of fuel wood has led a spread effect on the prices of fish, especially dried and roasted fish, a local staple in the study area has become very expensive because firewood and charcoal are becoming rather scarce and difficult to obtain.

Indigenous Adaptation Strategies to Fuel Wood. The use of modern heating equipments has been highly embraced in the study area because of the practical and visual impacts of climate change caused by the unsustainable use of forest resources. This modern heating mechanisms (modern cocoa dry ovens and modern cooking stoves) have the following advantages.

Fig. 5. Traditional Three stones fire (left) and Modern cooking stove (right)

Some women who could not afford to buy the modern cooking stoves go for the by-product of timber (saw dust) which is affordable at moderate prices.

Advantages of modern cooking stoves. They eliminate smoke, thus creating a healthier heating environment, heat faster and retain heat for long periods, save over 60% of firewood compared to a traditional three stone fireplace and prevent accidents from open fires.

Increase trade of fuel wood by women has attracted many women groups to identified the urgent need and desire to cultivate fast-growing fuel wood species on their farms Table 4. The forest provides other sources of energy. But the most commonly

Table 4.

Tree Planted by Women in the Fako-Meme Forest Region [1]

Wovia	Lysoke	Munyenge	Banga Bakundu
1995	1996	1995	1995
600 seedlings distributed but were lost in the nursery stage	600 seedlings of Cedrela odorata for fuel wood. Planted between small-scale oil-palm and rubber farms. Height of plant on inspection 3 metres (average). All plants in good state. 1998,450 seedlings of Prunus africana distributed. Trees in very good state.	400 seedlings of Terminalia superb and Cedrela odorata planted in a completely devastated for timber exploitation. 1998, there was a 2nd visit with 98% of trees in good state. Fast growing at the rate of 1 metre annually in a well managed condition.	1st and 2nd distribution of 600 seedlings of Prunus africana planted 5m apart in a 1 hectare land inside a valley bounded on each side by palm and rubber plantations. 60% of the plants survived. The trees varied in sizes with a mean height of 85cm. There was the need of more labour for clearing and mulching with palm cones.

used of all is fuel wood though other plants parts and biomass also produce energy. Both the males and females collect fuel wood for diverse reasons. While the male collect fuel wood to dry their fresh cocoa beans and to be used in bakeries, the female

collect fuel wood for domestic cooking as it is the main source energy. The few who do not collect fuel wood from the forest depend on purchased wood from wood traders. Only a few workers outside the forest-adjacent communities make us of electric cookers as their main source of energy. Since a greater part of this region is carved as state reserves, conflicts usually arise between the forest-adjacent communities and the Delegations of Forestry and Wildlife whose main goals are to conserve the forest.

Conclusions. With the increase in prices of natural gas and kerosene fuel which is not commensurate to increase household incomes, the use of fuel wood for heating remain in a steady rise. This added with the periodic scarcity of natural gas only add to the frustration on fuel wood exploitation. The adaptation strategies put in place are very insignificant to halt the exploitation of fuel wood in the region. For the forest-adjacent communities to fully adapt to these modern equipments there should be an increase in sensitization on the implications of over exploitation of fuel wood. This can be achieved through seminars, TV directed programmes and involvement of these communities in decision making.

In order for the forest-adjacent communities to acquire these modern equipments, their prices need to be subsidized. This subsidisation will encourage the use of these equipments. The study recommends the use of saw dust and charcoal which are by-products from timber. Keeping aside biodiversity loss from agriculture and agriculture related activities, there is an anarchical felling of trees for developmental purposes, fuel wood for heating, hunting, and illegal logging just to mentioned a few. All these have accelerated deforestation and land degradation. Fuel wood problem has become very glaring because of the general environmental threats mankind is facing in the wake of this 21st Century.

1. Bokwe A. Rapport de la mission Effectuée Autour du Mont-Cameroun (Province du Sud Ouest) relatif à la régénération de certaines espèces des produits forestières secondaires en voie de disparition / A. Bokwe, Ngatoum, D. ; Ministère de l'Environnement et Foret, Cameroun, AFRIKA FOCUS, 1994. –Vol. 27. – p. 7-21.
2. Bokwe S. N. Adapting forest governance to climate Change mitigation and poverty alleviation, the case of forest reserves in the Mount Cameroon region / S. N. Bokwe // Unpublished Ph.D Thesis, Buea, University of Buea, 2013. – p. 23-174.
3. Cleaver. K. Deforestation in the western and central African Forest / K. Cleaver // The agricultural and demographic causes, and some solutions: Conservation of West and Central African Rainforests, No. 1. World Bank Environment Paper, 1992. – p. 105-112.
4. Essama-Nssah B. A New Deal for Cameroon's Forests / B. Essama-Nssah, J. Gockowski, L.A, Kelly. : Managing a global resource: Challenges of forest conservation and development, World Bank series on Evaluation & Development, 2002. – Vol. 5. – p. 137-165.
5. Fuel wood as Percentage of Energy Consumption in Developing Countries. Available at http://solarcooking.org/fuelwood.htm. Accessed 16 August 2016.
6. IUCN. International Union for the Conservation of Nature Red list of threatened animals / IUCN // MCN, Gland, Switzerland, 1988. – p. 1-6.
7. Kaimowitz D. Economic models of tropical deforestation / D. Kaimowitz, Angelsen A. // A review of Center for International Forestry Research, FAO, Rome, 1998. – p. 89-98.
8. Lambi C. M. Man and the Changing Forest Landscape in Fako Division / C. M. Lambi, Mukete T.N.M. // African Journal of Social Sciences, Buea, 2016. – Vol. 7, No. 3. – p. 11-18.
9. Leach & Mearns, 1988; Mearns, 1995; Leach & Mearns (1996). Environmental Change and policy, pp. 441.
10. Mukete M. T. N. Community conflicts over forest resources in the Southern Bakundu Forest Reserve / M.T.N. Mukete // International Journal of Resource and Environmental Management, Buea, 2016. – Vol. 1. No 1. – p. 69-80.
11. Ndenecho E. N. Investigating the livelihoods of forest-adjacent communities in forest conservation projects: Case study of Mount Oku, Cameroon / E.N. Ndenecho // Journal of Applied Social Sciences,

University of Buea, 2007. – Vol. 6. No. 1&2. – p. 57.
12. Ndenecho Emmanuel Neba (2010). Implications of Fuel Wood Yield,Availability and harvest in Tubah Mountain Forest Cameroon. In Global Journal of Human Social Science, vol. 10 Issued 3 (Ver 1.0). pp. 49-55.
13. Ndoye & Kaimowitz (2000). Marco-economics, markets and the humid forests of Cameroon, 1967-1997, Journal of Modern African Studies 38 (2), pp. 225-253.
14. Njisuh Z. Feka. The effects of different gender harvesting practices on mangrove ecology and conservation in Cameroon / Z. Feka Njisuh, Mario G. Manzano, Farid Dahdouh-Guebas : International Journal of Biodiversity Science, Ecosystem Services & Management, 2011. – p. 12-14.
15. ONADEF. Liste des essences des forêts denses du Cameroun : République du Cameroun / ONADEF // MINAGRI, Yaoundé, 1991. – P. 64.
16. ONADEF. Normes des Stratification forestiere du territoire : Yaounde, Office National de Developpement des Forets / ONADEF // Ministere de l'Environnmenet et des Forets, 1992. – p. 19.
17. Pearce D. W. World Without End: Economics, Environment, and Sustainable Development, a summary / D. W. Pearce, Warford J. J. // The World Bank, Washington. DC, 1993. – p. 15.
18. Spears, J. (1986) Deforestation, fuel wood consumption and forest conservation in Africa: an Action Programme for FY 86 – 88. Washington D.C. World Bank.
19. Wolfe, N.D., Eitel, M.N., Gockowski,J., Muchaal, P.K., Nolte, C., Prosser, A.T., Torimiro, J.N., Weise, S.F. and Burke, D.S (2000): Deforestation, hunting and the ecology of microbial emergence. Global Change and Human Health, Volume 1, No. 1, pp. 10-25.

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