

## NOTES TECHNIQUES

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## An Alternative View of Deforestation in Central Africa Based on a Boserupian Framework

I. Bamba<sup>1</sup>, Marjolein Visser<sup>1</sup> & J. Bogaert<sup>2</sup>

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### Summary

*Deforestation remains a real concern for environmental managers. The main causes cited in a wide range of studies are: (i) agricultural practices, especially shifting cultivation, (ii) timber exploitation and (iii) charcoal and firewood production. All of these causes are exacerbated by population growth. This rather pessimistic view of the effect of population growth on the environment corresponds to the Malthusian theory. While there is unanimous agreement on the fact that these forests and their resources are invaluable not only for local populations but also for the entire planet, statistical predictions confirm that the population will place increased pressure on forested areas over the next few decades. Given the lack of clear policy at government level aimed at managing this heritage, it is vital that action is taken while there is still time. In order to help guide the activities of non-government organisations and institutions, which often fill the gaps left by governments with regard to agrarian issues, we propose an alternative approach to tackling the problem of tropical deforestation: the Boserupian vision. This alternative approach, in addition to increasing environmental awareness of the local populations by NGOs, sees population growth as an asset for development. It offers a new view of the required conditions for agricultural intensification based on techniques, which have been tried and tested elsewhere. The fight against deforestation must be initiated by means of agrarian transition in tropical rainforest areas.*

### Résumé

#### Une vision alternative de la déforestation en Afrique centrale par l'approche Boserupienne

*La lutte contre la déforestation tropicale demeure une réalité préoccupante pour les gestionnaires de l'environnement. De nombreuses études désignent comme causes: (i) les pratiques culturales, essentiellement l'agriculture itinérante sur brûlis, (ii) l'exploitation du bois d'œuvre et (iii) la production de charbon de bois et de bois de feu; le tout sous la pression de la croissance démographique. Cette vision plutôt pessimiste de l'effet de l'augmentation de la population sur son environnement correspond à la thèse Malthusienne. Alors que l'unanimité est faite sur le fait que ces forêts et leurs ressources sont d'une utilité inestimable non seulement pour les populations locales mais pour la planète, les prédictions statistiques confirment l'augmentation de la pression démographique dans les zones forestières pour les années à venir. Face à l'inexistence de politique claire de gestion de ce patrimoine par les états, il s'avère urgent de réagir pendant qu'il est encore temps. C'est pour contribuer à l'orientation des activités des organisations et institutions non gouvernementales qui ont pris le relais des états que nous proposons une approche alternative dans la lutte contre la déforestation tropicale : la vision Boserupienne. Cette alternative Boserupienne, en plus de la conscientisation de la population par les ONG, considère la croissance démographique comme un atout pour le développement. Elle pose les bases d'une réflexion plus poussée sur les conditions initiant une intensification agricole via l'adaptation aux conditions locales de techniques issues d'expériences déjà vécues ailleurs. La lutte contre la déforestation devra passer par le pilotage d'une transition agraire dans les zones forestières tropicales.*

### Introduction

When it comes to man's relationship with his environment, the thorny problems caused by the

reduction of tropical rainforest cover remain at the forefront, not only for the conservation of biodiversity,

<sup>1</sup>Department of Landscape Ecology and Plant Production Systems of the Free University of Brussels, 50 Av. F.D. Roosevelt, C.P. 169, B-1050 Brussels, Belgium.

<sup>2</sup>bambisso@yahoo.fr, Tel.: +32-2-650-21-32, Fax: +32-2-650-48-97.

<sup>2</sup>University of Liège/ Gembloux Agro-Bio Tech. Biodiversity and Landscape Unit, Passage des Déportés 2, B-5030 Gembloux, Belgium. Received on 03.09.10 and accepted on 13.09.11.

but also due to its probable influence on the current global climate changes (19). The causes of deforestation are wide-ranging but essentially of anthropological origin (2, 7). While some studies attempt to classify these causes, according to their level of intervention, into direct and underlying causes (17), the most widely accepted view identifies population density as the key variable, which explains the loss of forest areas at global level (12). This rather pessimistic view of the effect of population growth on the environment corresponds to the Malthusian theory. According to this theory (20), the human carrying capacity of natural environments is not only limited but also set in stone, while major population growth leads to an imbalance between the environment's productive capacities and the needs of its populations. In fact, the population increases exponentially if this growth is not halted by any limiting factor, whereas livelihoods, especially agricultural production, develop according to a linear progression. This prompted Malthus to conclude that, regardless of the actual livelihoods involved, it is therefore inevitable that they will rapidly fail to meet the needs of a growing population. In the short term, this leads to the institutionalisation of abortion and infanticide practices in the absence of effective methods of contraception and, in the long term, famines, epidemics or large-scale armed conflicts, which make it possible, in a negative way, to re-establish the balance between population density and the human carrying capacity of its environment. Malthus even argued in favour of positively controlling population growth, by means of preventive measures aimed simply at reducing birth rates. His theory was later adopted by the neo-Malthusians (15, 24), who believe that it is rather by means of emigration and pushing back agricultural frontiers that it will be possible to redress this balance. In other words, demographic pressure causes the decline of natural resources and, in order to avoid famine, the population moves to new unoccupied areas, while such areas still exist. Many studies, including even some very recent research, continue to confirm this theory. In tropical zones, according to Williams (28), the degradation of areas covered by forest is in close negative correlation to population densities. At regional level, in Central Africa, Achard *et al.* (1), Bogaert *et al.* (7), and Mayaux *et al.* (21) have shown that a negative causality exists between demographic pressure and forest cover. At local level, the studies conducted by Bamba *et al.* (5, 6) in the forest zones of the Eastern Province of the Democratic Republic of Congo confirm this tendency and essentially point to the following as practices that cause deforestation: shifting cultivation, timber exploitation, and charcoal/firework production, all of which are exacerbated by pressure from demographic growth, which is the ultimate cause of forest decline. Certainly, forests have long been used to produce goods and services for local populations. In Central

Africa, over 90% of households in forested areas are involving in agricultural practices; but with population growth of 2-3% per year, the need for food, space, fuel wood and cultivable land increase pressure on forest resources (10). In order to tackle this problem, the population of these forest regions clears even more forest by practising shifting slash-and-burn agriculture. This traditional agrarian system involves burning an area of forest before using it for discontinuous cultivation, with fallow periods that are many times longer than the cultivation period. Fallowing has the primary purpose of restoring soil fertility and the secondary purpose of preventing the build-up of weeds. However, constraints linked to the reduced availability of land and population growth negatively affect the sustainability of this agrarian system. This dysfunction leads to shorter fallow and extended cultivation periods (13). Over a period of time, the original forest vegetation does not have time to recover by means of the ecological succession following cultivation, which has a whole series of consequences, such as reduced soil fertility, lower yields per area unit and, due to this retroactive system, the obligation to cultivate more and more land in order to obtain the same yield per inhabitant. If it is practised in an unregulated way, as described by Bamba *et al.* (5, 6), deforestation caused by shifting cultivation represents a threat for the future existence of forest habitats and populations. In addition, it has been shown that, beyond a human density threshold estimated at 30 - 60 inhabitants per km<sup>2</sup>, the shifting cultivation system is no longer sustainable (13) and is becoming devastating for the forest. The population density remains low in most forest areas (16). If we consider, for example, the Eastern Province of the Democratic Republic of Congo, the average population density is 15 inhabitants/km<sup>2</sup>, which is rather low compared to the estimated national average of 25 inhabitants/km<sup>2</sup> (3). But, with average annual population growth estimated at 2.4%, within about thirty years, this density will double and reach the commonly agreed limit for the sustainability of shifting cultivation. Therefore, if this neo-Malthusian tendency continues, what can we expect in terms of the future of existing forests? Will we have to wait for them to disappear altogether before the affected populations react? Before answering this question, it would be useful to explore another approach: Boserup's theory (8).

#### **Boserup's theory: an alternative to deforestation**

An alternative theory to the purely Malthusian vision of relationships between populations and agrarian systems was developed by Danish agro-economist Ester Boserup (1910-1999), who worked in the field of economic and agricultural development for the United Nations and other international organisations. She was the author of many works, the most famous of which is entitled "The Conditions of Agricultural Growth:

the Economics of Agrarian Change under Population Pressure” (8) and translated into French under the title “Evolution Agraire et Pression Démographique” (9). This work adopts exactly the opposite of Malthusian theory, by considering that, in the non-industrialised countries, rural population growth is a favourable factor for agricultural intensification. It is seen as increasing the quantity of work and/or capital per cultivated area unit in order to increase the yield of each area unit. It would therefore be an illusion to expect an intensification of agricultural production if the population density remains low (18). In her analysis of agrarian dynamics based on increased land pressure, Boserup (8) identifies various stages of this development mainly according to the fallow duration<sup>1</sup>.

These stages range from shifting cultivation to permanent agriculture systems, which may include several agricultural cycles within the same year (18). Following problems caused by reducing the fallow period, populations are compelled to adapt their agrarian systems for the purpose of intensification.

Therefore, based on this Boserupian approach, demographic growth, instead of being negative, should be considered rather as a catalyst for change in terms of reorganising agricultural production and working towards intensification. The more population density increases, the more population will use its capacity for invention and technological innovation (26, 27). Man is equipped for creativity and rationality. This means that he is faced with constraints; he adapts and progresses technologically depending on the risk linked to his survival. But he will not do this if this need fails to make itself felt. Based on this argument, Boserup lays the foundations for a more advanced study of the conditions that initiate agricultural intensification, which has the merit of nuancing the Malthusian theory and reflecting on the possibilities of agricultural intensification in terms of slowing down the pace of deforestation currently observed in the forest region of Central Africa. The challenge is that of knowing the time scale, within which this intensification may take place in relation to the threat of relatively rapid environmental degradation following deforestation.

Agricultural intensification manifests itself in relation to changes affecting the relative contributions of three traditional factors for agriculture activities: land, labour and physical capital. The yield can therefore be expressed not only per area unit but also per labour unit (man/day) or per unit of invested capital.

The increasing scarcity of land due to the effects of demographic growth leads to an intensification, which may be reflected in increased labour investment per cultivated area unit, as observed in the agricultural history of the non-industrialised countries, or capital investment (acquisition of equipment, use of inputs, building construction) as currently observed in the industrialised countries.

In most African forest regions today, we are still faced mostly with a pre-industrial agrarian system, virtually without capital (primitive tools), but (still) equipped with a huge reserve of land. In this context, the shifting cultivation system optimises the yield per labour and capital unit (“rare” factors) at the expense of yield from the land, which is the less rare factor. However, we must remember that agricultural intensification achieved by increasing the amount of labour invested per area unit, based on this cultivation system, carries with it the heavy price of reduced labour productivity. In other words, it is necessary to work for longer in order to obtain the same productivity from the land. Under sustained demographic growth conditions and without alternative ways forward, sooner or later the population will have to learn to survive a crisis caused by the scarcity of land, as explained so well by Boserup (9). However, it may take centuries before we react in order to overcome this crisis. In this way, the experience gained in Europe should be highly useful. In fact, Mazoyer and Roudart (22) describe how this crisis phenomenon has repeatedly been followed by an agrarian revolution in the history of Europe. These crises have had explicitly Malthusian consequences (wars, famines and epidemics, such as the plague), which acted as negative controllers of demographic growth until the agrarian system was fundamentally transformed in the direction of intensification.

In reality, agricultural intensification, combined with the processes associated with pushing back the frontiers of agriculture, also depends on a whole series of social, political and economic factors (11). In fact, in forest areas, most land is customary land. For example, in the Eastern Province of the Democratic Republic of Congo, which, with over 73% forest cover, is now considered a *hot spot* for deforestation in the Congo Basin (1), customary land rights take priority over the rights of the state. Land rights are held and exercised by the clan or community, to which individuals belong, which have rights and duties (3). On the land belonging to his village, the individual or more precisely the household can choose freely where to place its fields, provided this does not infringe the

<sup>1</sup>Boserup's classification consists of five categories:

- Forest fallow or shifting cultivation (land is cleared in the forest, cultivated for one or two years then left fallow for a sufficiently long period, so that the forest grows back after a minimum of 15-20 years);
- Shrub fallow agriculture (during a fallow period of 8-10 years, the land is covered with bushes and shrubs, the duration of the cultivation period ranges from one year to a duration equivalent to that of the fallow period);
- Short-term fallow cultivation (the fallow period lasts only one or two years and the land is invaded by grasses during this period);
- Annual harvesting (the land is harvested every year but it is still possible to refer to it as fallow for the few months between the harvest and next sowing);
- Multiple harvests (the same field produces several consecutive harvests per year).

rights of other individuals, and can farm as much land as he wishes without restriction (3). In addition, the increased poverty, inadequate road infrastructures for the transport of harvests from fields situated far from the roads, combined with funding deficiencies for crop production, mean that agricultural potentials cannot be put to optimum use. In order to obtain food product supplies from the towns or imported from other countries, the rural population has to supply even more of the forest products demanded by the town dwellers (charcoal, firewood, etc.), which increases pressure on the forests. It must be noted that the lack of a clear integrated policy for managing the forests and agriculture means authorities in the relevant countries can take advantage of the financial windfall created from the exploitation and export of natural resources (wood and mines). This phenomenon is known as the "Dutch disease" (14). As long as the forest is available and accessible, left to itself, the population cannot understand why it should be deprived of this resource.

According to Boserup, agricultural intensification, combined with the reduction or even abandonment of fallowing, involves developing alternative techniques for the maintenance and restoration of soil fertility using local resources. Various possibilities can be envisaged depending on the pedoclimatic zones. In areas highly affected by deforestation or low forest cover, intensification can be achieved by integrating livestock farming increasingly closely with agriculture, based on the agrarian history of temperate Europe (22).

As this option would not be realistic in many densely forested areas (25), we currently believe that the only other realistic option is that of agroforestry. Agroforestry refers to a range of techniques and practices, in which ligneous species are intentionally combined with crops in an organised way when it comes to space and time. In a context, in which fields are increasingly far from the forest, this mixture of trees and crops may be more productive than their spatial separation (17, 29). In other words, agroforestry makes it possible to increase productivity per area unit, while providing fuel wood, fodder and fruit. But this set of techniques will not be adopted without the provision of participative research and development programmes aimed at demonstrating its possibilities.

The development of village forests, which are managed and administered by the village authorities, could also be beneficial for the collection of forest products. In fact, replanting with slow-growing forest species (high forest) and fast-growing species for firewood (coppices) could be integrated in the management of these forests in each village. This set of techniques must form the basis for the intervention of organisations and NGOs, aimed at providing a real alternative to populations faced with the loss of these natural resources, whose importance for the production of goods and services is recognised by the populations themselves (4, 23). These research and development programmes must be accompanied by non-contradictory and visionary agricultural, environmental and food policies. The current "Dutch disease" policy, which is to the detriment of agricultural development, leads to increased food product imports. Ultimately, this can only result in a major crisis, due to the population's growing dependence on the outside world.

Boserup's message (8) was that the human carrying capacity of an eco-region is not set in stone (Malthusian theory) but flexible, as man is able to transform an original eco-system in order to make it more productive for his needs, while preserving the forests required in order to supply a whole series of ecosystem services in deforested areas. Obviously, this flexibility also has its limits and beyond these limits, Malthus will be right again.

Our message is that it must be possible to reduce the pace of deforestation in Central Africa. This deforestation is caused essentially by an agrarian system, which has become anachronistic due to growing population densities. For this reason, we believe that the reduction of deforestation involves the provision of a new agricultural and environmental policy that is coherent and takes into account the need to accelerate the transition towards a new and more intensive agrarian system, which is therefore more in tune with the current population densities (18), while respecting limitations in terms of the flexibility of human carrying capacity. At the same time, this agrarian transition and resulting global economic development (22) will enable positive birth rate control and population stabilisation, which is the final phase of the demographic transition anticipated by the demographers (18).

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I. Bamba, Ivorian, Doctor of Science, Research professor in the field of landscape ecology, member of the Department of Landscape Ecology and Plant Production Systems of the Free University of Brussels, 50 Av. F.D. Roosevelt, C.P. 169, B-1050 Brussels, Belgium, bambisso@yahoo.fr, Tel.: +32-2-650-21-32, Fax: +32-2-650-48-97.

Marjolein Visser, Belgian, Professor of agro-ecology and agrarian systems, member of the Department of Landscape Ecology and Plant Production Systems of the Free University of Brussels, 50 Av. F.D. Roosevelt, C.P. 169, B-1050 Brussels, Belgium.

J. Bogaert, Belgian, Professor of landscape ecology, University of Liège/ Gembloux Agro-Bio Tech. Biodiversity and Landscape Unit, Passage des Déportés 2, B-5030 Gembloux, Belgium.