The Impact of Population Growth on Natural Forests in Rwanda

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Abstract— *Deforestation is a growing problem in many parts of the tropical world and one of the affected countries is Rwanda. The general objective of this study is to assess the effect of population growth on natural forest resource in Rwanda in general. Thus, this research focused on assessing the impact of population growth on natural forest of Rwanda. It critically examines how the population growth can impact natural forest. To achieve the set objectives, a cross sectional research design was combined with qualitative and quantitative approach. We collected secondary data from National Statistics Institute of Rwanda (NSIR), Ministry of Environment (MOE), Rwanda Environmental Management Authority (REMA), etc. The study adopted descriptive approaches in processing data. The findings show that above 45.27% of natural forests have been lost from 1984 to 2015 due to the high rate of population growth in Rwanda. As a recommendation, faced with a dense and rapidly increasing population on a fragile land resource, Rwanda must take steps towards transforming the economy and eliminating poverty through a Green Growth program. Family planning must be also adopted in reducing the impact of population growth on natural forestry preservation.*

Keywords— *Population Growth, Natural forests, Deforestation.*

I. INTRODUCTION

Deforestation is a growing problem in many parts of the tropical world and one of the affected countries is Rwanda. The population of Rwanda is 13,056,337 as of Saturday, October 31, 2020, based on Worldometer elaboration of the latest United Nations data. Rwanda has the most densely populated mainland African Country. In addition, the spread of poverty, the environmental degradation especially deforestation is due to local clearing of forest for their personal needs, such as for fuel and agriculture. Deforestation is indiscriminate cutting or overharvesting of trees for lumber or pulp, or to clear the land for agriculture, ranching, construction, or other human activities.

Forest is the resource that provides many benefits to the society. In addition to providing wood, forests provide a habitat for wild life, site for recreation, wildness, watershed protection and many other benefits. Forests worldwide are absorbing more CO_2 from the air but they come up short when it comes to sucking up the vast amounts of CO_2 emitted by humans into the atmosphere (Cross, 2019).

The impact of demographic changes on forests and the environment is often discussed in terms of biological carrying capacity, i.e. the maximum number of individuals that a resource can sustain. However, many factors influence carrying capacity, such as economic development, sociopolitical processes, and trade, technology, and consumption preferences (Bijendra, 2009).

Faced with a dense and rapidly increasing population on a fragile land resource, Rwanda had a steady increase in the population growth rate since 1960sdue to changes in different socioeconomic conditions in the world. So, where there is rapid population growth, environmental degradation cannot miss. For instance, according to Forest Investment Program for Rwanda, the natural forest cover of Rwanda was 429,728.47 Hain 1984 but has declined to 235,192.27 Ha in 2015. This means that over 45.27%of Natural forests in Rwanda have been lost.

Rapid population growth and the low economic standard of living in Rwanda have brought in their awake numerous consequences to land cover and use changes, change in climate and hydrological status in the country. In Rwanda studies have indicated that as there is agricultural land expansion at the expense of other land uses. Rwandan lands are fragile and forest, water and its biodiversity is climate dependent, which are still under stress due to population pressure and mismanagement of natural resources. The poverty stricken economy of Rwanda needed scientific management of its natural resources and balancing the population to cope up with the climate change and the challenges of the globalization of

economy. Thus, there is a need to review the population and environment interrelation at the country level in order to suggest the means to minimize adverse effect of population pressure on environment.

The general objective of this study is to assess the effect of population growth on natural forests resource in Rwanda in general.

II.   MATERIALS AND METHODS

2.1   Description of Study area

Rwanda has a population of over 12.6 million, living on 26,338 km^2 (10,169 mi^2) of land, and is the most densely populated mainland African Country (United Nations, 2019). According to official data from the World Bank and projections from Trading Economics 2019, the Gross Domestic Product (GDP) in Rwanda was worth USD 10.12 billion, 24.07 % of which is contributed by Agriculture, upon which around 72% of the working population employed in agriculture (FAO, 2015).
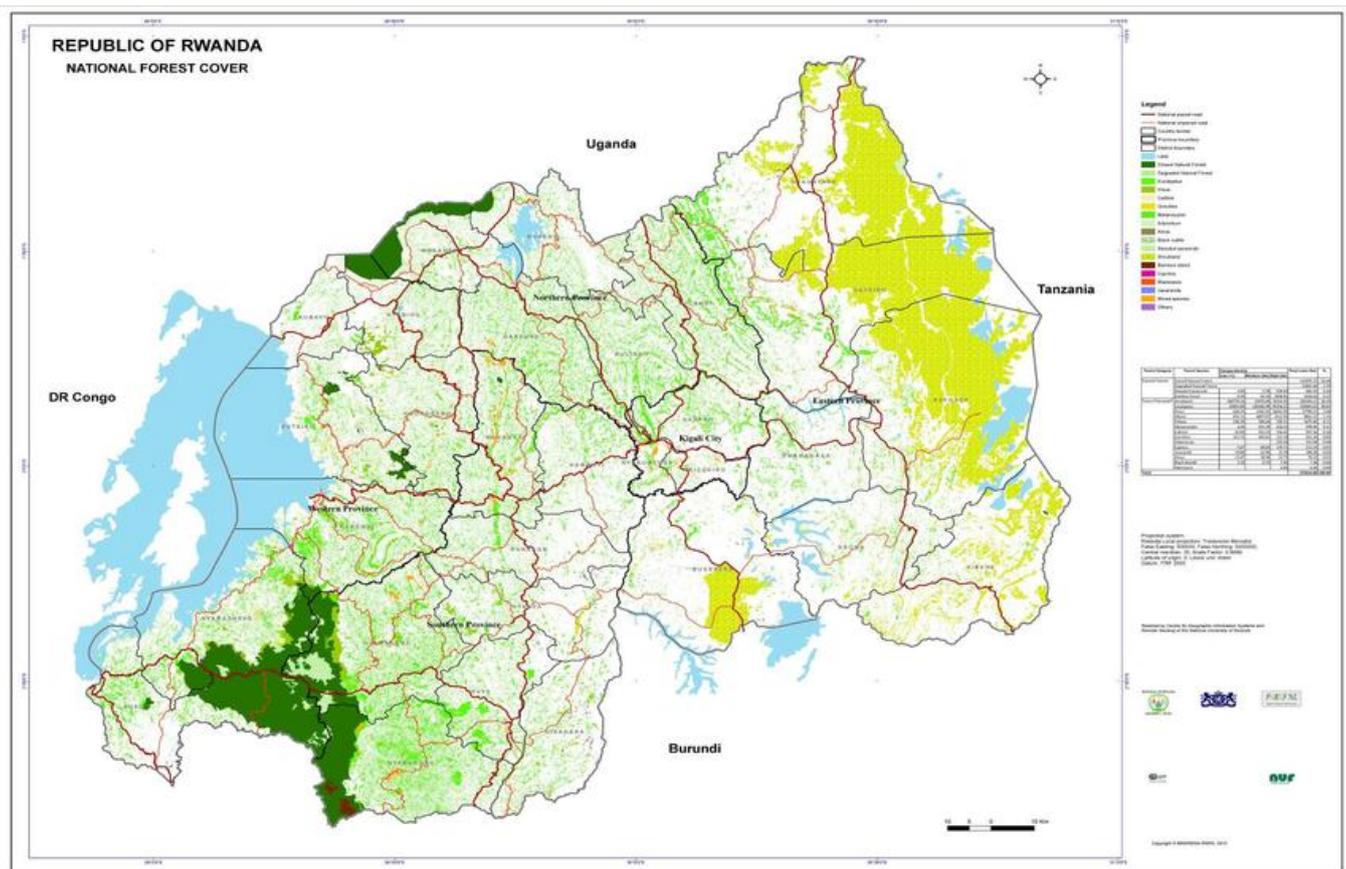

FIGURE 1: Map of Republic of Rwanda National Forests Cover

2.2   Data Collection

From 1960 to 2015, secondary data was collected from National Statistics Institute of Rwanda (NSIR), Ministry of Environment (MOE), Rwanda Environmental Management Authority (REMA), etc. We collected data on different projects related to natural forests and population growth in Rwanda. Secondary data involved different reports at the park levels, especially those from community partnership and ranger based monitoring programs.

2.3   Data analysis

We put all data in our computer and for data analysis we used SPSS and presented our data with tables and histograms.

III.   RESULTS

3.1   Population Growth

Population growth trends in Rwanda from 1955 to 2017 is shown in below figure 2.
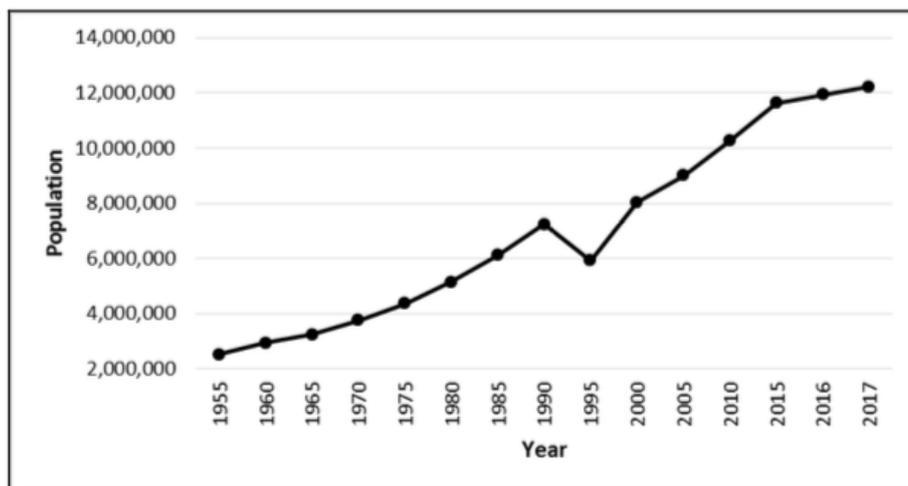
FIGURE 1. Population growth trends in Rwanda from 1955 to 2017

3.2 Natural Forest cover

Change over time from 1984 to 2015 of key natural forests in Rwanda is shown in below table 1.

TABLE 1
CHANGE OVER TIME FROM 1984 TO 2015 OF KEY NATURAL FORESTS IN RWANDA

Name of the Forest	Area (ha) 1984	Area (ha) 2015	% Loss
Buhanda Natural Forest	1116	18	98.40%
Gishwati Natural Forest	21213	1440	93.20%
Mashyuza Natural Forest	85	6	92.70%
Ibanda-Makera Natural Forest	1425	169	88.10%
Karama Natural Forest	3235	1061	67.20%
Dutake Natural Forest	31	11	65.70%
Karehe-Gatuntu Natural Forest Complex	48	19	60.30%
Nyagasenyi Natural Forest	45	19	58.20%
Akagera Natural Forest	267,741	112,185	58.10%
Mukura Natural Forest	4376	1988	54.60%
Sanza Natural Forest	49	24	51.00%
Mashoza Natural Forest	36	18	51.00%
Muvumba Natural Forest	1286	688	46.50%
Ndoha Natural Forest	39	29	26.00%
Kibirizi-Muyira Natural Forest	454	352	22.40%
Busaga Natural Forest	191	159	16.90%
Nyungwe National Park	112,230	101,005	10.00%
Volcanoes National Park	16,128	16,004	0.80%
Total	429728	235195	45.27%

IV. DISCUSSION

As the figure above shows between 1960 and 2007, natural forests declined considerably by about 45.27% due to different anthropogenic activities and resettlement of refugees. According to Forest investment Plan for Rwanda, the main drivers of deforestation and forest degradation in Rwanda are: (i) Agriculture, with 95% of households practicing traditional subsistence agriculture on small plots that have degraded soil structure and fertility due to continuous cultivation, (ii) Infrastructure development, (iii) Urbanization including the growing of built-up area, which increased by over 300% in the

period from 1990 to 2016, (iv) artisanal mining practices, with a high increase in issued mining permits but no restoration of abandoned mining sites, (v) Forest product extraction, mostly firewood, charcoal and timber and (vi) Limited forestry extension services

These drivers derive from different socio-economic factors including: (i) high population growth, with 83.5% living in rural areas and 16.5% in cities, the increasing pressure on forests from agriculture, urbanization and exploitation of forest resources are linked to the high population with limited land to sustain their livelihoods; (ii) Lack of awareness and alternatives, which has led to the failure of different projects aiming to promote sustainable forest management and full engagement of local communities. A brief summary of the impact of the agricultural, livestock, oil and mining sectors and their impact on the forestry sector and forest management is presented in Table 2 below.

TABLE 2
ANALYSIS OF LIVESTOCK, AGRICULTURAL, OIL AND MINING SECTORS AND THEIR IMPACT ON THE FORESTRY SECTOR AND FOREST MANAGEMENT

Analysis of sectoral problems related to forestry	Impact on the forestry sector and forest management
Agriculture	
✓ Population pressure coupled with farming land scarcity leading to unsustainable farming practices (no fallowing of land, limited use of fertiliser inputs and in many cases poor or inadequate soil conservation practices; hence over-cultivation, erosion and low yields). ✓ Some farmers are still practicing traditional farming practices.	✓ Deforestation within farming areas ✓ Expansion onto fragile ecosystems, including shrub lands (especially in the Eastern Province); marshlands and lands on steep and very steep slopes
Livestock	
✓ Despite the zero grazing policy, some livestock keepers are still grazing out in ranches or other pastures	✓ Overgrazing of available pastures leading to grazing even on forest lands
Oil and Mining	
✓ Some mining sites are located in forests (*e.g.* Mukura Forest) ✓ Artisanal mining is most dominant throughout the country and in most cases mined areas are not effectively restored. ✓ Mining causes scarring of the landscape and often leaves behind waste rock and tailings heaps. ✓ There is also pollution of water streams and severe contamination of fields downstream of mines.	✓ Deforestation and forest degradation due to mining activities in forests ✓ Environmental degradation, pollution of water supplies, negative social impact in communities as mainly practised by young men

V.   CONCLUSION AND RECOMMENDATION

According to the Ministry of Environment (MOH), forests currently cover around 30 % (10.3 % natural and 19.7 % plantations) of the dry land area of the national territory. Forests are the major source of domestic cooking energy, with 86.3% of the Rwanda population using bio-fuels in different forms, wood and charcoal being the dominant ones (MOH, 2017).

Forests also provide the foundation for Rwanda's tourism opportunities, and also protect watersheds, downstream wetlands and support agriculture. However, due to dense and rapidly increasing population on a fragile land resource, forests have been threatened by deforestation and continuous degradation.

Forests in Rwanda continue to occupy a high-table position as a major resource providing multiple functions to the population's livelihoods, supporting the equilibrium of the ecosystem and contributing to national socio-economic development.

Thus, sustainable management and use of natural resources and ecosystem services is well recognized as an important ingredient for sustained economic development and improvements in human welfare, and therefore is necessary for achieving the Sustainable Development Goals (SDGs). Environmental assets, such as soil, water and biodiversity, yield

income, offer safety nets for the poor, maintain public health and drive economic growth. Yet environmental sustainability goals are often seen as distinct from, and sometime in conflict with, development goals(KTH, 2016).

The direct causes of land degradation are mainly deforestation, overgrazing and overcutting, shifting cultivation and agricultural mismanagement of soil and water resources: such as non-adoption of soil and water conservation practices, improper crop rotation, use of marginal land, insufficient and/or excessive use of fertilizers, mismanagement of irrigation schemes and over pumping of groundwater. The indirect causes of land degradation are mainly population increase, land shortage, short term or insecure land tenure and poverty and economic pressure (FAO, 2015).

The economic contribution of forest are associated with the production, consumption of goods and services, the supply of fuel wood, construction materials and timber come mainly from forest.

The rapid deforestation or the declining of forest accompanied by variety of other environmental problems is caused by agricultural expansion and wood gathering. The major factors contributing to deforestation are poverty, low level of income and population growth.

For this reason households have to depend on clouding for their fuel consumption and this is hampering the farmers from using organic manure as fertilizer for their already degraded farmlands. The wide range of topography has contributed to the presence of enormous biological and cultural diversity.

One of the solutions proposed to arrest forest degradation in certain area is to introduce the practices of participatory forest management by involving the local people. The result of this study reveals that population growth huge impact on forestry development in the ways of expanding agricultural land, using wood as energy sources and satisfying the input requirements in agricultural activity. We also recommend Rwandans to use family planning services in reducing the impact of population growth on the forestry development.

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