CONSERVATION BALANCE BETWEEN HUMAN'S NEED AND ECOLOGICAL FUNCTIONS IN AJEI FOREST AREA, MOMO DIVISION, CAMEROON

Abstract

Understanding the place of humans in the ecology range has always been an important issue in geography. Most humansdepend on agriculture and natural resources for their livelihoods. Owing to this relationship, most salient consequences triggerdisconnectsbetweenhumans and ecological services. This paper examines the contribution of land use patterns on the improvement of human needs and ecological services in Ajei forest area. The methodology consisted of primary and secondary data: questionnaires,focus groups and interviews.Landsat Satellite Spacecraft Mission (LANDSAT, 1986,2020 and ASTER, 2003, 2007 and 2020) were used respectively.Secondary data were sourced from diverse specific literature backgrounds.The data gotten were analyzed using descriptive approach, presented in the form of figures, maps, and tables. Findings revealed that, in ~~Ajie~~Ajei area, humans highly depend~~s~~ on diverse resources for survival.Land use indicatorsfurther show that: agriculture (37.4%) is the principal drive of land use patterns followed by population growth (31.3%), settlement (10%), knowledge on increased ecological conservation (8.3%), accessibility (8%) and knowledge on increase deforestation (5.1%)while government, traditional establishments, NGOs and individual, were the main local pro-conservative minded stakeholders. In spite of the above pointers, there were land use challenges faced by the community which consisted of topography variations, slope steepness, institutional disparity, socio-economic and environmental constraints. The papersuggeststhat, to attain a balance between humans and ecological functions, there is a need to embrace a veritable conservation tactics by both stakeholders: a more comprehensive ecosystem management strategy.Implement land-use and land-management practices that are compatible with the natural and potential of the area, while emphasizing much more concern on adaptive management approach.

Key words: Conservation balance, man, ecological functions, Ajei forest area, Cameroon

Introduction

Increasing population in the world has fueled the need for agricultural products and farm expansions at the detriment of ecosystems. The relations between humans and ~~his~~ theirenvironment are changing so speedily that conservation balance is seriously endangered and, in thrilling cases, entire populations and ecological services may be threatened with extinction as some actual instancesdisclosed. Consequently, it has continued to be a driving force to continue thinking about human's need and ecological conversion in most part of the world. Substantial literature indicate that global forest cover stands at 32% with one-third still in primary state and occupying a surface area of about 4.06 billion hectares. More than half of these world forests are found in five countries namely:Brazil, Russia, Canada, United States of America and China [8]. Estimatesalso show that from 1990, approximately 420 million hectares of forest landhave been lost to farming, settlements and other land uses. This loss stood at a rate of 16 million hectares each year. However, increased conservationtechniques have caused forest land loss to fall from 16 million in 1990s to about 10 million hectaresper year between 2015 and 2020 [5,7].Rapid deforestation has remained a primordial

factor of environmental degradation in most developing countries. These havecauseda dropin households'income from forest products[4, 9,10].For instance,between 1990 and 2020, Ghana lost over 135,000 hectares of forest per year with an annual deforestation rate estimated at 2% [6, 8].

In Cameroon, forests have come under serous??? due to the creation of plantations estates. Besides, land usehas shifted from natural forest cover to agricultural farmlands and industrial plantations. Increasing population rate fueled the need for agricultural products and farm expansionsin turn have continued to be a driving force for the conversion of forest especially in the coastal montane areas [3,11]. In the Northwest region of Cameroon, since 1980, the development of a model known as the "Bamenda-Model" has been evoked in the Western Highlands of Cameroon and the Bamenda plateau inclusive has laid a positive remark on the side of the environment and conservation. This model has built up local resources in an ecologically stable and economically attractive landuse system. Thetransformation is observed through the introduction of drought oxen, introduction of integrated plant nutrition systems, erosion control with contour bunds and the integration of tress bushes into farming systems for sustainable landuse [10, 11].Within the Community of Ajei, Landuse change shows an overall forest cover changed with an ongoing deforestation from a myriad of stakeholders. This is a process that is continual within the forest patches as humans seek~~s~~ to gain more land for agricultural activities against the ecological stability and functioning [2, 12].Thus, this requires the situation should be monitored and conservedto suite the purpose of humans and ecological needs.

Research Problem

In the course of history, humans and ~~his~~ theirdevelopmental activities have remained dynamic. The milieus~~men~~ humanscreate through their wants constitute to a very large extent the plan of life they transmit to successive generations.The dynamisms have been characterized by continuous evolution in human knowledge, transformation and changes associated with the use of land. The changes are observed to be fueled by ~~man~~humansand their quest to exploit natural resourcesto improve living conditions. It is unfortunate therefore that we know so little and make so little effort to learn how the total environment and resources affect the physical and our mental developmental activities.In Ajeiarea, the need to use land for diverse activities such as grazing, crop production, settlement and forest conservation is so conspicuous but does not submit to theexpected canons of the local environmental planning and biodiversity conservation. The unsustainable human activities within this community triggered by land resource degradation warrantsthe application of perpetual conservation laws to guide human's quest on resources at the detriment of ecological functional

organs. The existing regulations are often not welcomed by the community especially when they are top-bottom oriented. In a situation where top-bottom oriented scenario holds, it generatesstiff resistancewith the indigenes.In the study area, agricultural activities are the main accomplishment at the detriment of ecological functions especially in forest areas. Faced with these long standing problems, in 2014, Participatory Forestry Management Programs (PFMP) was introduced as a co-habitation approach whereby the adjacent population have to exploit the land for their needs and at the same time conserve forest patches for ecological development. At present, landuse conflicts such as indigenous and state conflict on resource ownership, farmer-grazier conflict on pastures, and grazier-grazier conflicts are most recurrent.There is no reservation that the covert potentialities of human beings have a better chance of being comprehended when the environment resources are sufficiently diversified to offer a variety or inspire experiences, especially for the younggeneration.Conscious of these, conservation measures to protect the natural environment from varied environmental degradation activitiesare bound to be thought of. Thus, given the present drifts of population dependence on these resources, this paper opines that, it will continue to pose problems of land use and management if appropriate measures are not taken to redress the balance between humans and ecological functions.

Study area

Ajei village is a carved-out locality in Ngie Sub Division, Momo Division of the North West Region of Cameroon. It lies betweenlatitude $5^{o}54'0''$ and $5^{o}58'0''$ North of the Equator and betweenlongitude $9^{o}51'0''$ and $9^{o}53'0''$ East of the Greenwich meridian. The village is one out of the 19 villages that make up NgieSub-Division with a population of over 6,544 inhabitants [1, 2, 5].Figure 1 below shows the administrative and geographical location of AjeiArea inMomo Division.

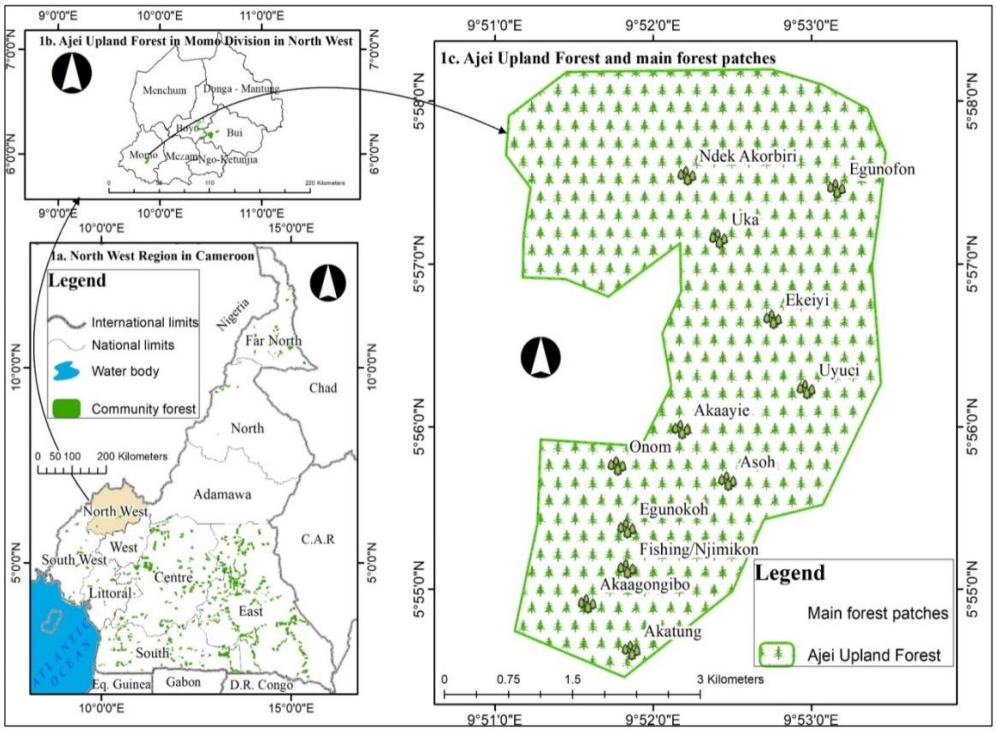

Figure 1: Location of the Ajei Upland Forest in Momo Division
Source: National Institute of Cartographyyaounde,(2017)

The Ajei study forms part of the Cameroon volcanic line with the highest peak at Ndek-Akorbiri (2,028m). It's second after mount Oku with 2,772m within the NorthwestRegion of Cameroon. The study area contains numerous Community Forest Patches (CFP) in the likes of Asoh, Onom, Akaayie, Akatung, Egunofon, Esing\Njimikon,Akagongibo, Uyuei,and Uka.

Methodology

Primarily, a preliminary field visit was made where contacts were established with the Community leaders, Municipal Councilors and the service of forestry and wildlife.This was followed by prior meetings organized with the village chiefs and the influential villagers to explain the essence of this work.Field data was generated from two sources namely*:*field investigations and remote sensing data acquisition. Primary data was gotten through a random administrationof 100 open and closed questionnaireswhile four images scenes were acquired from the Landsat Satellite Spacecraft Mission (LANDSAT, 1986,2020)and ASTER, 2002, 2007 and 2020). These image scenes were stacked in a GIS environment to create composite image for classification and later on mosaic to one composite

image for each study period as can observe in the maps.Field observations also helped to match the field realities with the remote sensing satellite imageries.A focus group wasconducted in order to understand the vision of the community dwellers vis-à-vis human's needs and ecological functions as well as the evolution of land use. Data gotten were analyzed using descriptive statisticapproach. The results were presented in tables, pie chart, bar charts and maps for better understanding.

Findings and Discussion

Hum~~M~~andependent on forest resources

The relations between humans and ~~his~~ theirenvironment are changing so rapidly that well-balanced ecological state is seriously ~~endangered~~endangered, and, in extreme cases, entire populations may be threatened with extinction of some resources[13].Natural resources in general and forest products in particular, play an important role in rural lives of Cameroonians. Field findings indicate that, the inhabitants of Ajei make recourse to the forest for farming, grazing, fruits harvesting,exploitation of Timber Forest Products (TFP) and Non Timber Forest Products (NTFP). Within most of the forest patchesexist diverse species of trees with different uses to the local community as indicated in Table 1 below.

Table 1: Forest-based need of man in the Ajei community

Common name	Scientific Name	Local Name	Use to the Community
Camwood	*Baphia nitida*	Abaranag	Cultural activities, timber and fuelwood
Kola-nut tree	*Cola nitida*	Ubeau	Kola-nut fruit, ~~timber~~timber, and fuelwood
Bitter kola	*Garnicia cola*	Abitakola	Medicinal, fruit, source of household income and fuelwood
Pear tree	*Pyrus sp*	Piah	Fruit, shed and fuelwood
Moringa	*Moringa oleifera*	Uchou	Medicinal extraction
Njansah	*Ricinodendron heudelotti*	Esiey	Spices and fuelwood
Wild Plum	*Prunus americana*	Afarah	Fruit, shed and fuelwood
Plum	*Prunus sp*	Uchioy	Fruit, kraal,timber and fuelwood
Guava	*Psidium guajava*	Gwavah	Fruit, kraal, construction of fences and fuelwood
Sand leave	*Binomial pumila*	A~~a~~kiey	Fuelwood and construction of fences
Small leaf	*Tilia cordata*	Utiford	Fuelwood
Mahogany	*Swietenia macrophylla*	Eguieh	Timber and fuelwood
Mango tree	*Mangifera indica*	Magoroh	Timber, shed and fruit

Black Berry	Vitex micronata	Ekia	Fruits are eaten unripe to clean internal system Seeds are used for ring warm treatment Used as antidote for snake/scorpion bite
Lemon grass	Cymbopogon citratus	Ejapp	Extracted oil used in aromatherapy Relieve pain Used as malaria antidote
Ebony	Diopyros apiliformia	Gia	Back used for diarrhea treatment Leaves/back used to purify mother's breast milk

Source: Field work,(2019)

From field observation, most of these flora resources undergo human degradation due to themultifaceted roles the community attached to it. Aside extraction of NTFP related to flora, it is revealed that animal hunting is so conspicuous in the Ajeiforest. These animals include African Palm Civet and squirrels and bird'sspecies such aspied crow, gray headed sparrow, ~~swallow~~swallow, and collared sunbird. Owing to theseresources exploitation state of affairs albeit humans may hold to the philosophy of conservation, accept~~s~~ the loss of much natural wealth as the price of livelihood. This study seeks to know a critical momentthat humans can arrive at consciousness to call a halt to bald exploitation, and to match exploitation with sustainable ~~conservation,~~conservation.

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Land Cover/use changerange in AjeiArea

Slightly over three decades, Ajei ecological zone has witnessedchanges on land use/cover scenery. The remote sensinginterpretation classifiedland use/cover in the study area into four types Including forest, grassland, degraded land and settlements. Table 2 and Figure 2 show detailed statistics of the classified Landsat satellite images of Ajei as indicatedbelow.

Table 2: Landcover/use statistics for Ajei Area

Land Use	**1986**	**2003**	**2007**	**2020**
	ha	**ha**	**ha**	**ha**
Forest	1,114.23	1,090.47	1.067.62	1,022.09
Grassland	931.89	303.90	321.80	380.87
Degraded Grassland	--	647.33	647.60	628.36
Settlements	0.18	4.26	9.02	15.06
Total	**2046.38**	**2046.38**	**2046.38**	**2046.38**

Source: Estimated from LANDSAT, (1986), ASTER, (2003, 2007 and 2020)

Figure 2: Percentage of Land cover/use change statistics in Ajei Area

Source: Classified ASTER, (2020)

Ensuing from thefield studies, the most dynamic land use in Ajei areais grassland. This grassland embodies farming and grazing landswhich corresponds to the second land use in thearea after forest.Grassland shows a marked declined between 1986 and 2003 from 45.54% to 14.85% and remained relatively stable in 2003 to 2020, while settlements witnessed a steady but unnoticeable increase from 0.008% (in 1986) to 0.74% (in 2020). The relative stability in the forest proportion (Figure 2 and Figure 3)~~is a reflection of~~reflects the Participatory Forestry Management Programs which the local population has been trained to exploit the land for their needs and equally strive to attain balance on forests patches to maintain its ecological services. This conservation approach has shown a positive balance as the forest patches in the study area have remained relatively balanced as from 1986-2020 (Figure 2). Figure 3 and Figure 4 presents the land use evolution for Ajeiarea in two periods.

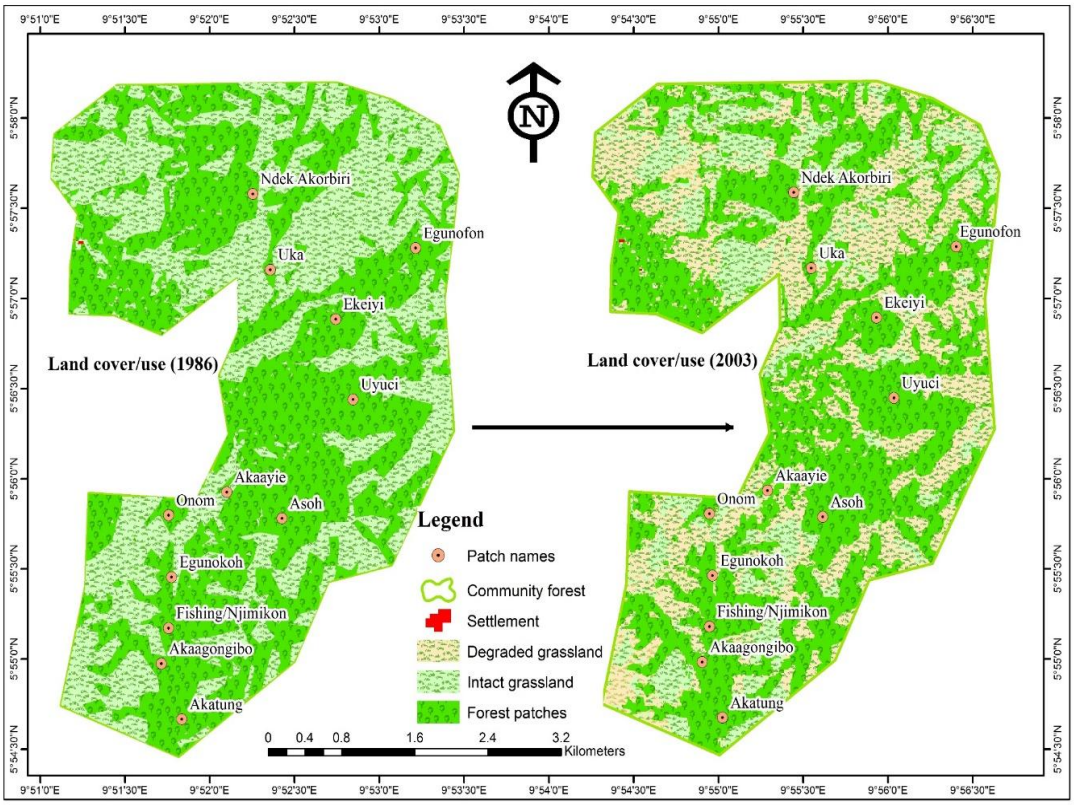

Figure 3:Land cover/use for 1986 and 2003
Source: Classified Landsat, (1986) and ASTER, (2003)

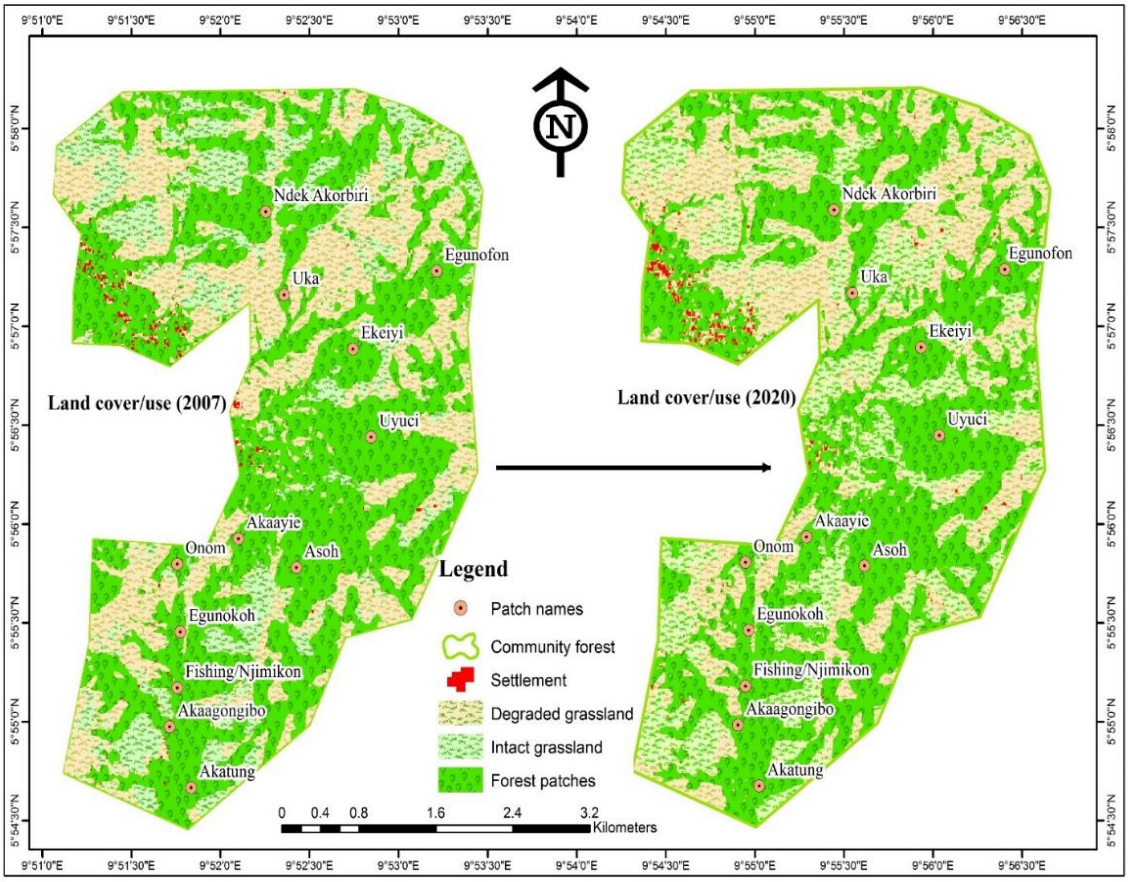

Figure 4: Land Cover/Use for 2007 and 2020
Source: Classified ASTER, (2007 and 2020)

Field results indicated that agriculture, 37.4% and population growth, 31.2% remain the main propelling forces behind the landuse change in the study area (Figure 5).

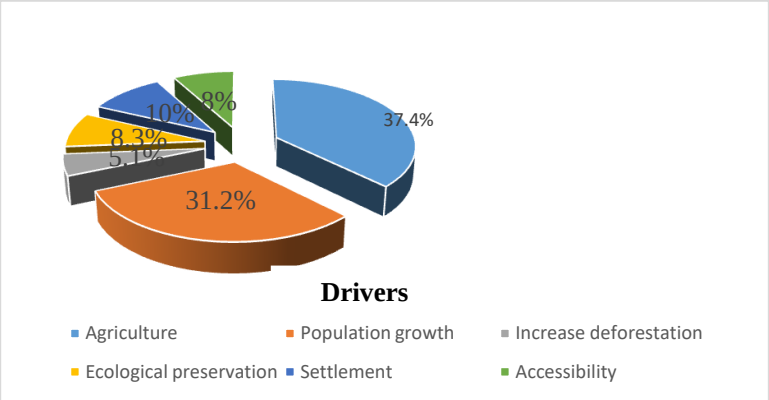

Figure 5: Drivers of land use change in Ajei Area

Source: Field work, (2019)

In the study area,agricultureas a main driving force in land use constitute both mono and mixed cropping activities which take place within and around forest patches. The most prominent grown crops includemaize, cocoyams, yams, beans cultivatedetc. In addition, grazing activities involving rearing of horses and cows on hills and small ruminants such as goats, sheep,~~pigs~~pigs, and birds are domestically reared.The resultstie with the study of[15] where farming / grazing are the main drivers of land use in the study area. Closely followed are population growth with 31.2%, settlement and construction 10%, ecological activities 8.3%,accessibility 8% and lastly deforestation 5.1%.In all these drivers varied and each had a tremendous contribution to Land used change in the study area.

Stakeholders and conservation activities in Ajei Area

In natural resource management, the most important question is whether the interplay between humans and ~~his~~ theirnatural as well as social backdropsare well controlled.Faced with unstainable conservation of natural resources in the study area, most stakeholders have in their various spherespontaneously reacted in order to halt or control the devastated manner of the resource management. This falls in line with the awareness about creating a balance between human's needs and ecological services. In Ajei area, thereare stakeholders including Individuals, Customary institutions, community, NGOs and state institutions as indicated in Figure 5.

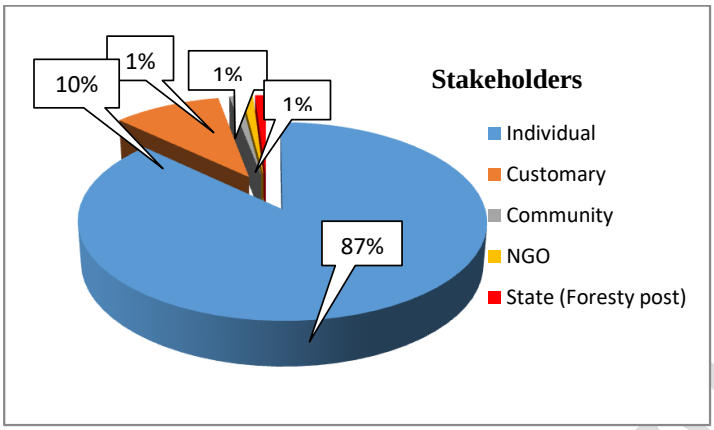

Figure 6: Forest conservation stakeholders in Ajei Area

Source:Field survey, (2019)

From Figure6, individual's awareness and conservationinevitability ranksthe highest among the stakeholders. This is observedthrough planting of agroforestry trees (pears and mangoes), more farming out of forest patches, and the limited bushfires phenomenon.The local authorities; customary institutions are also observed in the scene with conservation measures in the field. The traditional councils constantly deliberate on strategies to safeguard customary ritual places in the forest. They do this by delimiting forest area, prohibitingsome places and using others for customary rites. Typical examplesare the ancestral place locally baptizedas "Obeg-fiem" at Akwokwei area, and preservation of species meant for local medicinal purposessuch as*Ekia* (Black Berry) and *Uchou* (Moringa).Thisfalls in line with the African customary views in which ancestral spirits leave in trees, holes,forest and caves [16]. With regards to Ajei Community as stakeholders,the conservation awareness is pictured through the conservation of patches of sacred sites (Table 3).

Table 3: Enhanceconservation by sacred sites in Ajei Area

Sacred Site	Location	Purpose
Ancestral forest	*Fon*'s palace	-Believes to harbours the spirit of forefathers -Visit by the *Fon* to invoke certain spiritual powers
Sacred tree	*Fon*'s palace&Some Households	-Spiritual incantation -Intermediary instrument to ancestors -Harbours the spirit of ancestors
Sacred cave (Obeg-Fiem)	Akwokwei	-Use to send thunder to the enemy camp

Source: Field survey, (2019)

In course of exercising these traditional norms, some flora and faunaspecies are conserved thereby enhancing forest conservation.The presence of a lone

NGOsCameroonwildlife conservation society(CWCS)with the collaboration of the MINFOF services carried out a lot of conservation activities. Since 2015, CWCS started operating in the study area by carrying out inventory, classification of tree species and planting of new tree species.Experimental studies reveal that the notion of conservation among various stakeholders has incentivized the spirit of ecology awareness in the study area thatis worth encouraging. Thestakeholders' conservation strategies in Ajei area ties with the study of [13] as both studies brought to focus the role of forest management in this part of the world.

Challenges faced in land Use at Ajei Area

In spite of several conservation efforts by stakeholders there are continuous conservation challenges in the study area. The dwellers faced a multitudeof landuse challenges owing to physical to humans' triggers. The most severe physical obstacle observed in the study area is the topography feature. Ajei area and environs are a mountainous area with few valleys and no plane. Figure 7shows some topographic variations which generatedland use challengesin Ajei forest area.

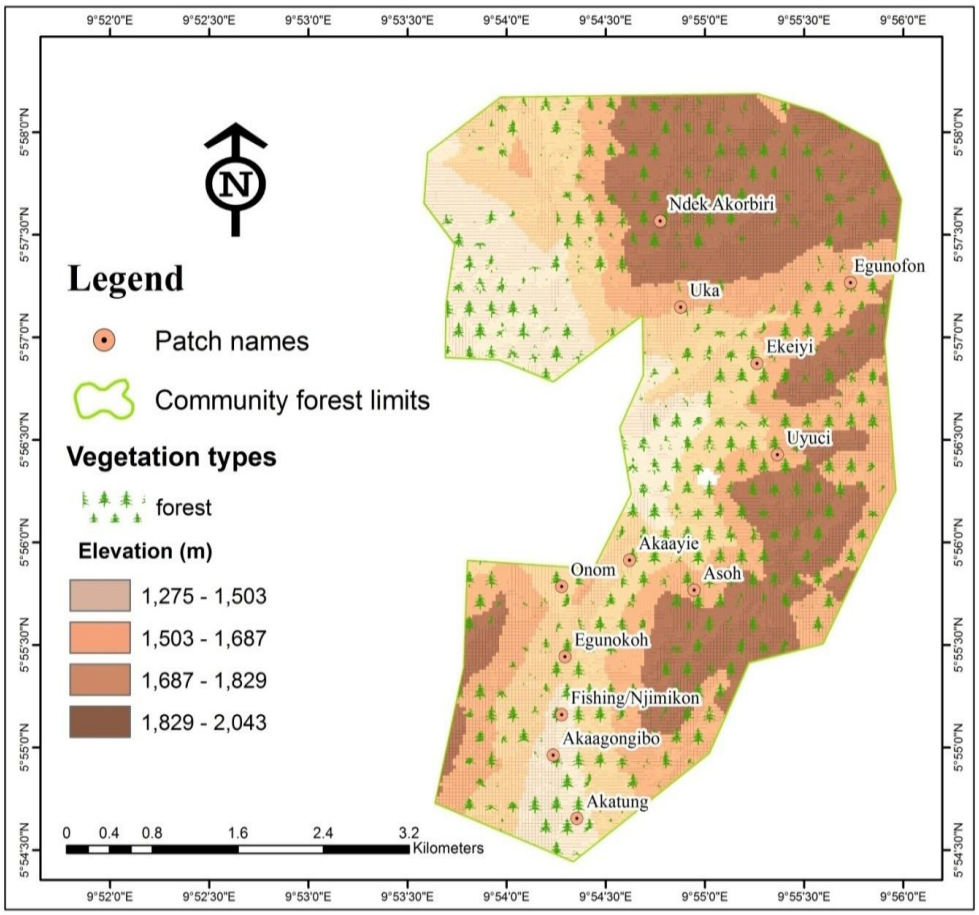

Figure 7: Relief and Vegetation features in the Ajei Area

Source: Author, ASTER and LANDSAT Imaginary, (2020)

Figure7vividly exemplifies the elevation of the Ajei area landscape with 2,028m altitude at Ndek-Akorbiri noted as the highest point with little human activities, an altitude second in the North West Regionto that of Mount Oku in Cameroon [1]. The topographic disparitiesposemultiple challenges to landusers whereby, farm lands are~~either partially~~partiallyaccessible due to roughness nature of the terrain,and tilled soils are frequently washed down during periods of rainfall. They constitutechallenges from one end, and are seenas ablessing to ecological development in the other end. In addition, slope variations across the entire area constitutesome physical barriers compare with smooth land.

Aside physical obstacles, there are also institutional challenges that hold back effective conservation that could meet ecological balance the study area. These challenges are observed, the Government service, CWCS and Local institutions both face challenges that slow the effective management of the resources in Ajei area. The service of ministry of wildlife and forestry (Chief of Forestry and wildlife post) based at Andek in Ngie cannot alone oversee the activities right up to the Ajei. The CWCS faces a lot of resistant in discharging their conservation activities from the local population.This is because the locals see them as agents of Government to grab their land, and believe the resources are a gift of nature belonging to the concept of common pool resources,consequently, they do not at all times collaborate with them hence revealingthe problem of truth by the local population. Traditional leaders also faced some issues which are not friendly to effective conservation of forest resources: the lengthy periods and procedures of conflict resolutions on abused resource exploitations in local courts and farmer/grazer conflicts induce more exploitations. Definitely, we sourced out a complex land use conflict traversing two folds including~~:~~ conflict of resource ownership between the locals and Government/NGOs and farmer/grazer conflict over pastures in the study area.This outcome differs a bit from that of [14] it focused only institutional, financial and administrative issues without considered physical features. Above all, it is evidently clear thatfor the needs of humans to balance off with the ecological services, there is need to revisit management approach by the stakeholders in the study area.

Conclusion and recommendations

Land use in Ajei area is viewed in line with resource exploitation and a special considerationto ecological development,as well as the management strategies of natural resources. Even if there is sufficient learning and intelligence to achieve a harmonious state of ecological balance between humans and the other constituents in the Earth, much effort

must be deplored for it to becompatible with human's continuing development. The stake often arises given that human's needs are unlimited and the constant evolution of human societies with alteration of land from one form and uses to another in a bid to make the best out of land for livelihood. Land usage is a general planning challenge itself buta more complicated matter in rural areas where local population depend primarily on natural resources.In Ajei area, from 1986 to 2020, the rate of deforestation owing tohuman's need has increased exposing some inequity between humans and ecology function.

Conservation actions by individuals, customary bodies, community, NGOs and state agents have been effectively at work with varying conservation contributions. Indeed, all of human's biological and environment developments so far are mostly as a result of chances or shade choices. Many actions have had concerns which had not been foreseen and often proved to be unsuccessful. In all, despite the conservation efforts displayed in the area, this study holds that, to upkeep a balance land use between humans and ~~his~~their natural environment in Ajei area,stakeholders'determination should accentuate the planting tress species of economic value such as mangoes, plums, cola-nut and pears. The proper land use policies in this rural area should be developed withthe community participation approach. Reinforce conservation sensitization talk to create awareness of ecological benefits to the Ajei ~~man~~population.Introduction of alternative livelihood projects such as bee farming, palm plantation and palm wineit is production???? and their production?????.Above all, strengthening awareness of a common resources through mutual appreciation of resource values and the preservation of the heritage and traditions of the past could help balance human and ecological needs in the study area.

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