

THE DETERMINANTS OF CITIZENS' ATTITUDES TOWARDS EUCALYPTUS TREE REPLACEMENT PROGRAMMES FOR SUSTAINABLE DEVELOPMENT IN BUI DIVISION, NORTH WEST REGION OF CAMEROON.

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ABSTRACT

This study examined the attitudes of citizens towards Eucalyptus tree replacement programmes in Bui Division, North West Region of Cameroon. The tree species named eucalyptus was introduced in this Region by the German missionaries in view of enabling the inhabitants have access to fuel wood for cooking and heating. But in subsequent years, it was discovered to be environmental unfriendly as it consumes a lot of water, deposit leaves that have poisonous chemicals to undergrowth, extend its roots to neighbouring farms and render those farms unproductive. To mitigate the threats posed by this tree species to the environment and livelihoods, a number of Non-Governmental Organisations, Forest Based Organisations, Local councils as well as the Cameroon government through its ministries have carried out a number of projects as well as sensitization campaigns to enable the citizens replace the eucalyptus tree with environmentally friendly tree species. The descriptive research design was employed for this study and a sample size of 150 participants was purposively selected for the administration of questionnaires containing closed and open ended questions. The questionnaires were complimented by Focused Group Discussions. The data collected were analyzed using the simple percentage, t-test and multi-linear regression techniques. The findings revealed the following: that land ownership as it is controlled by men determined the eucalyptus tree replacement effort; that cultural uses significantly determined the replacement effort but in a negative way; that there is a relationship between eucalyptus replacement effort and campaigns, that is, if the level of information increased by 100% the replacement effort would increase by 21%. However, this information or campaigns did not significantly influence the replacement effort. Also, the level of education of respondents significantly affected replacement effort positively and a 100% increase in the level of education was likely to increase replacement effort by 15%. Based on the economic factors, the value of eucalyptus or income received by citizens

was significantly negative and if incomes received by the citizens' increased by 100% there was a likelihood of replacement effort to decrease by 18%. The authors therefore recommended that to resolve the issue of land ownership, the cultural uses and information dissemination about the eucalyptus plant, more education needs to be carried out on the effects of the plant.

Keywords: Citizens, Attitudes, Eucalyptus, Tree Replacement, Sustainable Development, Bui Division, Cameroon

Introduction

Development which is the ultimate goal of every human society is promoted in different ways based on the needs of communities. In this light, a wide number of actions are implemented in different parts of the world by governments and different development-oriented organisations aimed at economic growth and the enhancement of the living standards of its citizens. Though these actions have brought benefits to human communities, some of them still geared towards better living and development have been generating environmental problems that are becoming difficult to handle and are causing a wide range of effects worldwide. It is for this reason that Myers in the World Watch Report of 2007 highlighted that over the past two-to-three hundred years, humanity's ecological footprints have ballooned to such an extent that we are now fundamentally altering the planet. He held that, humanity has transformed the earth's land surface and altered the function of its ecosystems; and continues to trigger the rapid loss of both terrestrial and marine life, profoundly changing our planet's climate. He held that the changes we are wreaking on the environment are imperilling not only on many of the other species with which we share the ecological stage, but also on the health and wellbeing of our own species.

These problems originate through diverse human activities and modifications such as deforestation, afforestation and re-afforestation with environmental unfriendly tree species, increase in competing land uses, pollution of land, sea and air, wastes disposal problems and overall environmental degradation. Some of these issues have been identified and attempts made to tackle them in a number of conferences such as Kyoto Conference 1997, Copenhagen Conference 2009, the Paris Conference 2015 and the Marrakech Conference 2016. These conferences focused on the development of climate protocols to keep the process of fighting climate change on line. All these aimed at addressing the alarming and deleterious effects of global warming generated by industrialised nations and other emerging developing economies through the emission of greenhouse gases (UN Framework Convention on Climate Change Report, 2009). The aftermath of these human actions on earth is the generation of unceasing poverty especially in the developing nations. It is for this reasons that Ilevbaoje's (2006) call for a symbiotic relationship to be maintained for sustainable development with the wise use of the environment is advocated, with a clarion call on all and sundry to be environmental friendly.

In 2000, the United Nations set out eight development goals to improve the lives of the world's disadvantaged populations. The goals seek reductions in poverty, illiteracy, sex inequality, malnutrition, child deaths, maternal mortality, and major infections as well as creation of environmental stability and a global partnership for development. According to McMichael (2009) and United Nations (2000), one problem of this itemization of goals is that it separates environmental considerations from health considerations and poverty cannot be eliminated while environmental degradation exacerbates malnutrition, disease and injury. Food supplies need continuing soil fertility, climatic stability, freshwater supplies and ecological support which are not stabilised in circumstances of a changing environment. The then UN Secretary General Ban Ki-moon outlined seven priorities for 2010, beginning with the urgent need for a renewed focus on sustainable development, including advancing efforts to achieve the globally agreed targets aimed at ending poverty, disease and hunger (Word Press, 2010).

It is based on effort towards better living that the eucalyptus plant was introduced in Cameroon communities of the grass fields in the 1900s by German missionaries aiming at solving the problem of fuel (wood) shortages. But recently, the plant was found to have adverse effects on the ecology of the areas it occupies. Njodzeka (2009) in an article entitled "Conserving Water through Planting Trees" mentioned that the changing pattern of rainfall in Cameroon since 1960 is due to a number of factors of which eucalyptus is included. Njilla (2000) identified that the eucalyptus plant in Bui Division (*Eucalyptus deglupca* and *Eucalyptus smathii*) lowers the water table and leads to a reduction of the volume of surface water. This could be the reason why within a period of less than 20 years, the division now faces a lot of water shortages, crises and / or conflicts (Njilla, 2015a & b; Njilla, 2010).

In 1989, a report funded by United States Agency for International Development (USAID) and the Khon Kaen-based Rural Development Institute looked at the effect of eucalyptus plantations in several North Eastern Provinces of Thailand. The report concluded that large eucalyptus plantations can deplete underground water sources; eucalyptus leaves decompose slowly and fall in greater numbers than other crops; toxins in the leaves inhibit the growth of other crops; and a eucalyptus plantation uses a higher overall volume of water than other crops (Lang, 2007; Shiva and Bandyopadhyay, 1985a & b). Environmental sustainability therefore becomes important as the water and soil resources on which the local populations depend upon for survival in Bui Division of the North West Region of Cameroon are becoming depleted. This is due to the eucalyptus culture which is adversely affecting livelihoods thereby generating and/or exacerbating poverty. It is against this background that this study was carried to determinant the attitudes of citizens towards eucalyptus replacement programmes for sustainable development in Bui Division, Cameroon.

2. The Problem, Objectives and Research Questions

With the discovery of the environmental unfriendliness of the eucalyptus plant in occupied areas of the North West Region of Cameroon, lots of effort had been made to re-address the issue so as to help safeguard the human ecology and livelihood. From the mid 1980s to the early 1990s, the government departments and traditional authorities in Cameroon sought solutions through administrative orders with some punitive sanctions against defaulters who continued the planting of eucalyptus trees.

In 1998, following reports on the devastating environmental impacts of the eucalyptus trees and its continuous planting in marginal lands such as watersheds, catchment areas and water tables, the then Senior Divisional Officer for Bui, Tanyitiku Bayee-Arikai Martin on the 3rd of February 1998, issued a Prefectorial Order No. 10/98 bearing on the destruction of eucalyptus trees at all water catchments and water tables throughout Bui Division. Article 1 of the Order stated thus: “that with effect from date of signature of this Order owners of all eucalyptus trees at all water catchments and water tables throughout Bui Division are ordered to cut them down and prevent the further growth of these trees”. Article 2 further stipulated that “failure to respect the terms of Article 1 above, Municipal Councils shall proceed, within their respective areas of competence, to the effective destruction of these trees at the expense of their respective owners”. It was further stipulated in Article 3 that this Order shall be executed by all Sub-Prefects (Divisional Officers) for Bui, all Mayors for Bui Councils, the forces of law and order for Bui and all the traditional rulers / authorities in Bui Division. Eighteen years after this order, Bui Division has seen a continuous upsurge in the proliferation of eucalyptus plantations at various localities including watersheds and catchments areas. For example, according to Njilla (2015a), out of the 102 catchments serving 34 village water schemes in Kumbo Central Sub-division, 40 (about 40%) are invaded by eucalyptus plantations.

Sensitization campaigns on awareness of the negative effects of eucalyptus trees were made through councils, churches and organizations as well as Local Non-Governmental Organisations advocating for its replacement in watersheds, catchment areas and individual plantations (Ndambi and Ndzerem, 2006). Reinhold (1993) indicated that despite the increased awareness worldwide on the dangerous ecological situations brought about by increased eucalyptus plantations, there is still a lack of practical action at all levels. Despite the fact that early studies have demonstrated that the eucalyptus plant is a source of land degradation and awareness raised in so many human communities worldwide including Bui Division, many people still propagate and preserve the existing plantations. This study therefore aims at examining citizens’ attitudes as regards activities towards eucalyptus tree replacement for environmental sustainability and rehabilitation of livelihood.

The general objective of the study was to determine factors influencing citizens' behaviour as concern actions towards eucalyptus tree replacement for sustainable community development in Bui Division. The specific objectives were to: determine the influence of land ownership on citizen's implementation of eucalyptus tree replacement projects; examine the influence of cultural factors on citizen's attitude towards eucalyptus tree replacement, investigate the effect of campaigns on citizen's attitude towards eucalyptus tree replacement actions; investigate the influence of citizen's level of education to response towards eucalyptus tree replacement; and examine the influence of income derived from eucalyptus on citizen's choice of agricultural land use in Bui Division.

The study therefore sought to provide answers to the following questions: Does land ownership have an effect on the process of eucalyptus tree replacement in Bui division?; do cultural uses of the eucalyptus plant influence citizen's attitude as regard eucalyptus tree replacement actions?; do communities access campaigns for eucalyptus tree and do these campaigns influence their choice of plantation?; is education a factor that influences citizen's attitude as regard agricultural land use?; does income derived by citizens from the eucalyptus plant play a role in the choice of agricultural land use?

3. Eucalyptus Tree and Eucalyptus Replacement Programmes

3.1 The Situation of Eucalyptus Plant in Bui Division

Before the 1920's, there was an abundance of unexploited and untitled land especially in the rural areas of Cameroon. The first introduction of eucalyptus trees to the grassland areas of Cameroon dates as far back as the 1900's by German missionaries aimed at improving on fuel (wood) availability. Later on, around the 1960s, there was a drastic fall in the prices of coffee in Cameroon and the world. This problem was coupled with high infection rates caused by the coffee pod disease, which led to great losses for local coffee farmers. Coffee was the major cash crop of the grassland areas and Bui Division in particular, generating enough income for families. The result of the price drop was the indiscriminate planting of eucalyptus without site consideration (Ndambi and Ndzerem, 2006).

3.2 Physical Characteristics of Eucalyptus

Eucalyptus trees belong to the family *Myrtaceae* and of Australian origin but now diffused to Africa, Asia, Latin America and Southern Europe. The trees have leathery leaves which hang obliquely or vertically, and are studded with glands containing a fragrant volatile oil. The flowers are covered with a cup-like membrane, which is thrown off as a lid when the flower expands. The fruit is surrounded by a woody, cup shaped receptacle and contains numerous minute seeds (Grieve, 2006).

3.3 Importance of Eucalyptus trees

The fast-growing nature of eucalyptus makes it ideally suited to the production of wood for pulp, timber (including poles) and fuel wood (May and Ash, 1990). The trees produce straight stems which are suitable poles for carrying electricity and telephone cables. Eucalyptus also contains oil which is very important and has high commercial values in some countries. The oils may be roughly divided into three classes of commercial importance: the medicinal, industrial and aromatic oils (Grieve, 2006). In Cameroon, commercial eucalyptus oil production is less common. The species is mainly used for wood, timber, poles and the leaves are also used as a component of herbal concoctions for the treatment of fevers and other diseases (Ndambi and Ndzerem 2006).

3.4 Problems Associated with Eucalyptus Tree and Institutional Mitigations

Three main problems have been attributed to eucalyptus cultivation (Shiva and Bandyopadhyay, 1985a & b; Lawbuary, 1985). Eucalyptus is water intensive, and reduces water available for other species, effectively out-competing them. This is worse in arid areas where the consequent suppression of other plant life, coupled with a high water demand, reduces soil moisture, preventing the recharge of groundwater, and can reduce local water tables. This is aggravated by a high transpiration rate indicative of the inefficient use of water. The introduction of such species with high water demand destroys the hydrological balance and contributes to increasing aridity and eventual desertification. Eucalyptus is nutrient intensive, which creates deficits for other plant life, a process that is exacerbated by its low returns in leaf litter to the soil. Thus, it does not promote the building of humus, and by implication, does not contribute to the long-term fertility of the soil as other species might, resulting in an overall nutrient impoverishment of the soil. Eucalyptus is toxic, due to allelopathic properties, which serve to reduce not only other plant life, including crops, by restricting germination of other species, but is also detrimental to soil micro and macro-fauna. Eucalyptus can jeopardise the biological productivity, principally of arid regions due to allelopathic properties. It also has a deleterious effect on other plant life, including crops, by restricting germination of other species (Shiva and Bandyopadhyay, 1985a & b, Lawbuary, 1985). Various eucalyptus species can yield allelopathic chemicals which may be effective in suppressing under storey vegetation. This allelopathy was found to be in relation to rainfall and the soil water balance. Though decay could reduce the allelopathic effects of substances from eucalyptus leaves and bark, some inhibitory chemicals remained in the soil after 5 months of decay (May and Ash, 1990).

Indispensable cases of introduction may also arise; for example, the eucalyptus tree, due to its tolerance to poor soils and its firm soil gripping roots, is useful in controlling landslides on hilly areas with acidic soils in the Western Highlands of Cameroon. To remedy the problems caused

by this plant and maintain the ecological balance, the local government councils in Bui Division and some Local Non-Governmental Organisations such as the Strategic Humanitarian Services (SHUMAS) Bamenda, Green Care Shisong, Catholic Justice and Peace Commission, Kumbo undertook projects towards this course. With assistance from Future in Our Hands UK (FIOH-UK), SHUMAS carried out two phases of the eucalyptus tree replacement project (EUREP I and EUREP II) starting with sensitisation geared towards the obliteration of eucalyptus trees in targeted watersheds / catchments and farming areas, and nursing of native environmentally friendly trees for planting. Thereafter, there was planting proper which was more concentrated on affected watersheds / catchments areas following written agreements with the local councils, the water authorities and individual land owners.

More than one million indigenous trees (over 27 different species) were grown in SHUMAS nurseries and used to replace the trees felled in watershed / catchment areas, council plantations and individual plantations. Many of these environmentally friendly trees were nitrogen-fixing, fruit producing, animal forage and medicinal, unlike the eucalyptus which was barely used for wood and timber. The outcome was as follows: More than 700,000 mature eucalyptus trees were destroyed and replaced by indigenous African tree species, all capable of promoting wildlife, usable by humans and increasing the badly lowered water table. Green Care Kumbo provided training on how to care for saplings and also encouraged women to participate in the process, since they are those who mostly collect water for the families. A good number of women have participated in sensitization campaigns and awareness raising forums and also in planting activities. With these efforts about 11,000 trees have been planted by Green Care in seven community watersheds / catchment areas and individual lands. This is grossly inadequate with respect to the total surface area occupied by eucalyptus.

4. Methodology of the Study

The descriptive survey research design (Ngozi, 2004) was used for the study. This was aimed at systematically describing the facts and characteristics of the studied population (Olanyinka *et al.*, 2006; Punch, 2008). It attempted to determine attitudes and behaviours of the inhabitants of Bui Division towards eucalyptus replacement effort by the local government authorities and Local NGOs in the North West Region of Cameroon. The design also helped in evaluating peoples' practices which enabled us to generate recommendations on how to tackle the passive attitude of eucalyptus growing communities towards replacement efforts.

The population of study consisted of residents of three councils of Bui Division in the North West Region of Cameroon which covers a land area of about 2,297 km² as of 2014 with a total population of about 554,133 inhabitants. The three sub divisions were chosen out of six because these are the sub divisions with the highest proportion of eucalyptus plantations in terms of areal

coverage and total number of trees. The residents in these communities were owners of eucalyptus plantations which still exist or may have been cleared off for the purpose of protecting the environment in which they live from degrading.

The sample for this study consisted of 150 respondents drawn from 30 villages in 3 councils of Bui Division. This is because the study area is too large for the researchers to cover and obtain data from about 163 communities of this Division comprising of 6 councils as follows: Kumbo (urban), Jakiri, Mbiame, Nkum, Elak-Oku and Noni.

The purposive sampling technique was employed for this research work focusing on the inhabitants who owned eucalyptus plantations in selected three council areas from the existing six councils in Bui Division. Five villages were then selected at random within each council and a total number of six respondents within each village were chosen to answer the questionnaires. This gave a total of 150 respondents who furnished us with the data needed for this study.

The instruments that were used in the collection of information for this study were the questionnaire accompanied by interviews and focused-group discussions. The questionnaires comprised of close and open ended questions used to probe for answers from citizens about their attitude towards the replacement of eucalyptus.

The instruments for the study were subjected to face and content validity checks. This was done with the help of the supervisor and other researchers and research students versed with environmentally related issues. The draft questionnaire was first submitted to some of researcher's referees at the Department of Sociology and Anthropology in the University of Yaounde I, Yaounde, Cameroon. Thereafter, the corrected copies of the questionnaire were presented to the researcher's supervisor for examination and final approval. The corrected questionnaires were subjected to test-retest method and computed using the Product Moment Correlation and the reliability of 0.78 and 0.82 were obtained.

The inferential data were analysed using the student t-test and multiple linear regression that helped us established the relationship between the two quantitative variables. The t-test was employed for variables that could not be scaled. The regression coefficient was then calculated to get the regression equation, from which the significance was tested to understand the extent to which each independent variable influenced the dependent variable.

5. Findings and Discussion

This study was undertaken with the main aim of ascertaining the attitudes of Bui citizens towards eucalyptus tree replacement programmes undertaken by a number of Non-Governmental Organisations and Forest Based Organisations as well as sensitization efforts of the government towards the reduction of the cultivation of this tree species.

5.1 Demographic / Socio-Economic Characteristics of Respondents

From the findings, 33.3% (50) of the respondents were from Kumbo Central Sub-division, 33.3% (50) from Jakiri Sub-division and 33.3% (50) from Nkum Sub-division which gave us proportionate representation in the study.

With regard to gender, findings revealed that 76.0% (144) were males and 24.0% (36) were females. This therefore implies that men are highly involved in eucalyptus tree activities than women in the Bui communities.

Concerning the age distribution, findings also revealed that 0.6% (1) of the respondents were between the ages of 20-24 years; 1.9% (3) between the ages of 25-29 years; 13% (20) between the ages of 30-35 years; 6.5% (10) between the ages of 36-39 years; 9.1% (14) between the ages of 40-44 years; 17.5% (27) between the ages of 45-49 years and 48.7% felled within the age range of 50 years and above. This implied that a majority of the respondents were within the ages of 30-35 and 50 and above. This meant that the older people become, the more they are involved in eucalyptus tree cultivation activities.

With reference to the educational attainment of the respondents, 53.3% (80) attended primary school; 26% (39) had a secondary school certificate; 10.7% (16) studied to post secondary level; 6.7% (10) attended non formal education programmes and 3.3% (5) never had access to the four walls of a classroom. This therefore implied that eucalyptus tree cultivation was mostly in the hands of citizens who have obtained basic education while those who never had access to education were minimally involved in eucalyptus cultivation. It therefore presupposes that the citizens should have basic understanding of the needs for eucalyptus replacement objectives in Bui Division.

Based on the marital status of the respondents, 93.3% (140) were married; 5.3% (8) were unmarried; 0.7% (1) divorced and 0.7% (1) was a widow. This therefore implied that marriage was highly promoted in the Bui community.

With reference to the religious affiliation of the respondents, 84.7% (127) were Christians while 15.3% (23) were Muslims. This area is mostly dominated by Christians as compared to a small population of Muslims.

With reference to family size, 23.3% (35) of the respondents were from families with 1-4 persons; 64.7% (97) from families with 5-9 persons; 12.0% (18) respondents from families with 10-14 persons. This therefore implied that the average family size in Bui communities constitutes of 5-9 persons and only a few families have lesser or populations above this average size. Based on this average size of 5-9 persons per family, there emerged a regular need for the eucalyptus plant which serves as fuel wood and for economic purposes.

Based on the profession of the respondents, 51.3% (77) were farmers; 8.7% (13) were involved in business; 16.7% (25) were civil servants; 4.0% (6) were unemployed; 8.7% (13) were retired; .7% (1) a tradi-practioner; 10.0%; (15) were builders, mechanics and tapers. This implied that the Bui community is dominated by people who practice subsistence agriculture and invest on eucalyptus tree as an alternative income source to sustain their families.

6. Findings on the Major Themes of the Study

As regards the acquisition of Eucalyptus plantations, 56.7% (85) planted it; 2.0% (3) inherited it; 7.3% (11) purchased it; 10.7% (16) planted a portion and inherited part of the plantations; 16.7% (25) planted and purchased; 6.0% (9) inherited and purchased and 0.7% had planted, inherited and purchased eucalyptus plantations (Table 1). This therefore showed that a majority of the eucalyptus tree plantations were acquired through planting by the citizens. This therefore meant that the citizens actually choose where to plant the eucalyptus trees, since a majority of them took the decision to plant the trees.

Table 1. Acquisition of Eucalyptus Tree Plantation

Plantation acquisition	Frequency	Percent	Valid Percent	Cumulative Percent
Planting	85	56.7	56.7	56.7
Inheritance	3	2.0	2.0	58.7
Purchase	11	7.3	7.3	66.0
Planting and inheritance	16	10.7	10.7	76.7
Planting and purchase	25	16.7	16.7	93.3
Inheritance and purchase	9	6.0	6.0	99.3
All of the above	1	.7	.7	100.0
Total	150	100.0	100.0	

Source: Authors' Field work (2015)

Table 2. Ownership of Eucalyptus Tree Plantation

Ownership	Frequency	Percent	Valid Percent	Cumulative Percent
Father	110	73.3	73.3	73.3
Mother	3	2.0	2.0	75.3
Entire family	36	24.0	24.0	99.3
Male children	1	.7	.7	100.0
Total	150	100.0	100.0	

Source: Authors' Field work (2015)

As regards ownership of the eucalyptus plantations, 73.3% (110) of the respondents held that it was the father, 2.0% (3) held the mother could be designated the owner, 24.0% (36) held that the entire family owned the plantation and 0.7% (1) held that it was the male children (Table 2). This therefore showed that men dominate ownership of the eucalyptus plantations in Bui division.

Table 3. Decision about Eucalyptus Tree Replacement

Replacement decision	Frequency	Percent	Valid Percent	Cumulative Percent
Father	136	90.7	90.7	90.7
Mother	3	2.0	2.0	92.7
Entire family	9	6.0	6.0	98.7
Children	2	1.3	1.3	100.0
Total	150	100.0	100.0	

Source: *Authors' Field work (2015)*

Considering the eucalyptus tree replacement decision and land ownership, 90.7% (136) of the respondents held that it was the males who made such decisions and own land; 2.0% (3) held that it was the mother; 6.0% (9) held that it was the entire family and 1.3% (2) said it was the children (Table 3). This implied that men hold the say as concerns eucalyptus tree replacement and land ownership issues while women have an insignificant say. Women only have a great say in homes with no male counterpart.

Table 4. Importance of the Eucalyptus Trees

Importance	Frequency	Percent	Valid Percent	Cumulative Percent
Friendship Ties	4	2.7	2.7	2.7
Title	23	15.3	15.3	18.0
Medicine	8	5.3	5.3	23.3
Protection	29	19.3	19.3	42.7
All of the above	55	36.7	36.7	79.3
Foreign	31	20.7	20.7	100.0
Total	150	100.0	100.0	

Source: *Authors' Field work (2015)*

With respect to cultural importance of the eucalyptus plant 2.7% (4) of the respondents held that it plays an important role in the reinforcement of social ties amongst the natives; 15.3% (23) said it was used for the acquisition of traditional titles amongst the people of Bui Division; 5.3% (8) used it for medical purpose; 19.3% (29) identified it was used for protecting land and 36.7% (55) identified a combination of the above mentioned factors. Notwithstanding 20.7% (31) thought it

did not play any role in the culture of the Bui communities since it is a foreign tree species (Table 4). This implied that the eucalyptus tree is of great importance on the cultures of the inhabitants of Bui Division of the North West Region of Cameroon.

Table 5. Importance of the Eucalyptus Tree Replacement Programmes

Importance of replacement	Frequency	Percent	Valid Percent	Cumulative Percent
No importance	7	4.7	4.7	4.7
Medicine	100	66.7	66.7	71.3
Material for artefacts	8	5.3	5.3	76.7
Rehabilitation of animals	3	2.0	2.0	78.7
Playground	3	2.0	2.0	80.7
Ritual sites	2	1.3	1.3	82.0
Others	27	18.0	18.0	100.0
Total	150	100.0	100.0	

Source: *Authors' Field work (2015)*

Concerning the importance of eucalyptus replacement to the culture of the people of Bui Division, findings revealed that 4.7% (7) did not see any importance of the replacement process; 66.7% (100) respondents thought it was important for the regeneration of medicinal values; 5.3% (8) held that materials for the production of artefacts will be regenerated; 2.0 % (3) thought it will lead to the rehabilitation of animal environment; 2.0% (3) held that play grounds will be regenerated and 1.3% (2) held ritual sites will also be created. The other 18.0% (27) held a combination of the above mentioned factors were important for eucalyptus replacement (Table 5). This implied that a majority of the Bui citizens supported the importance of the eucalyptus tree replacement programmes despite the fact that they put little action to effect the desired changes.

Table 6. Means of Information Acquisition on Eucalyptus Replacement Programmes by Respondents

Means of information acquisition	Frequency	Percent	Valid Percent	Cumulative Percent
Radio (local)	26	17.3	17.3	28.7
Churches	9	6.0	6.0	34.7
Groups (njangis)	14	9.3	9.3	44.0
NGOs / CBOs	13	8.7	8.7	52.7
Government agencies	5	3.3	3.3	56.0

Observation	11	7.3	7.3	63.3
Others	55	36.7	36.7	100.0
Never been informed	17	11.3	11.3	11.3
Total	150	100.0	100.0	

Source: *Authors' Field work (2015)*

Table 6 indicates that as concerns information circulation about the effects of eucalyptus tree and eucalyptus replacement in Bui Division, 11.3% (17) had never been informed while 88.7% (132) had been aware about its environmental effects. 17.3% (26) had been informed through the local radio; 6% (9) through churches; 9.3% (14) through groups; 8% (120) through NGOs/CBOs; 3.3% (5) through government agencies; 19.3% (29) through observation; and 36.7% (55) through a combination of the above factors. This therefore showed that information dissemination about the environmental unfriendly nature of the eucalyptus plant did reach the Bui citizens despite the observation that little action has been taken by community members.

Based on reaction to eucalyptus replacement in Bui communities, 75.3% (113) of the respondents did not take any action while 24.7 (37) took action to replace the tree species with native trees. 8.7% of non practicing respondents related it to the inability to cut the trees; 7.3% to high coffee taxes; 12.7% (19) had not seeds; 6% (9) to non reaction from other plantation owners; 3.3% (5) to marginal location of the land; 16% (24) identified men were in control of the land and 21.3% (32) combined the above mentioned responses (Table 7).

Table 7. Eucalyptus Tree Replacement Problems

Problems encountered	Frequenc y	Percent	Valid Percent	Cumulative Percent
Practicing	37	24.7	24.7	24.7
Inability to cut	13	8.7	8.7	33.3
High coffee taxes	11	7.3	7.3	40.7
Unavailable seeds	19	12.7	12.7	53.3
No mass action	9	6.0	6.0	59.3
Located in marginal land	5	3.3	3.3	62.7
Men in control	24	16.0	16.0	78.7
Other (future uses)	32	21.3	21.3	100.0
Total	150	100.0	100.0	

Source: *Authors' Field work (2015)*

Table 8. Economic Importance of Eucalyptus Tree

Economic importance	Frequency	Percent	Valid Percent	Cumulative Percent
Poles	7	4.7	4.7	83.3
Polines	25	16.7	16.7	100.0
No Economic importance	41	27.3	27.3	27.3
Total	150	100.0	100.0	

Source: *Authors' Field work (2015)*

Table 8 shows that 72.7% (108) of the respondents had economic returns from the eucalyptus plant while 27.3% (42) did not have economic benefits from it. For the 72% that had benefitted from the plant 44% (66) derived it from the sales of wood; 7.3% (11) from the sale of plank; 4.7% (7) from sales of poles and 16.7% (25) represent the combination of the above mentioned factors. A majority of the Bui citizens therefore derive an income from the eucalyptus tree species.

Table 9. Income derived a Year from Eucalyptus Tree

Income (FCFA)	Frequency	Percent	Valid Percent	Cumulative Percent
No income	41	27.3	27.3	27.3
5,000-10,000	25	16.7	16.7	44.0
10,000-20,000	49	32.7	32.7	76.7
20,000-30,000	17	11.3	11.3	88.0
30,000 and above	18	12.0	12.0	100.0
Total	150	100.0	100.0	

Source: *Authors' Field work (2015)*

Table 9 shows that 27.3% of the respondents generated no income from the eucalyptus plant; 16.7% generate about 5,000frsCFA – 10,000frsCFA per year; 32.7% generate about 10,000 – 20,000 FRS CFA per year; 11.3 % generate about 20,000-30,000frs CFA per year and 12% generate about 30,000 and above per year. This implied that many Bui citizens had little returns from the sales of the eucalyptus tree and its products but amongst them, very few citizens (12%) made mega gains from the eucalyptus tree. This is very true especially at the point of establishment of the plantations with a gestation period of up to 10 years before the commencement of exploitation. Thus, there are many years that the farmers have to continually invest in the plantations.

7. Presentation of Findings according to the Research Questions

Table 10. Research Question 1; Does land ownership have a significant relationship in the process of eucalyptus tree replacement in Bui Division?

Pair sample t-test of the relationship between land ownership and eucalyptus tree replacement effort.

Variables	N	Mean	Standard deviation	df	V	t	sig
Landownership	150	1.18	0.593	148	0.066	16.170	0.000
Replacement effort		0.24	0.430				

Source: Authors' Field work (2015)

Table 10 showed that there was a significant relationship between land ownership and eucalyptus replacement efforts. This was because the t-calculated value of 16.170 was greater than the table 5% critical value of 1.960. Also $P < 0.05$ and the r-calculated value of 0.066 showed that there was a weak positive relationship between land ownership and replacement effort. This result was inconsistent with the fact that land ownership determined the replacement effort and the replacement effort could also be influenced significantly by land ownership.

Table 11. Research Question 2; Do cultural uses of the eucalyptus plant influence citizens' attitude as regards eucalyptus tree replacement effort?

Simple Regression of cultural use and eucalyptus tree replacement effort				
Dependent variable: Replacement effort				
Method: Least squares ; Included observations: 150				
Variable	Coefficient	Std. Error	t-statistic	Prob
C	0.387	0.077	5.036	0.000
Cultural use	-0.177	0.086	-2.051	0.042
R ²	0.028			
R ² -Adjusted	0.021			
S.E of Regression	0.428			
F-statistics	4.208			
Prob (F- statistics)	0.042			

Source: Authors' Field work (2015)

The results in Table 11 showed that there was a significant negative relationship between cultural use of eucalyptus and replacement effort. A cursory look at the table showed that a 100% increase in cultural use was likely to reduce the replacement effort by approximately 18%. This

further showed that cultural use significantly determined the replacement effort but in a negative way. This was because the absolute value of t-calculated was 2.051. $P < 0.05$ and the coefficient of cultural use was negative. Furthermore, the R^2 -value of 0.028 meant that only about 3% variation in replacement effort was being explained by cultural use. This meant that there were other factors that affected replacement effort not captured by this model. Finally, the F-statistics value of 4.208 and its probability value of 0.042 meant that the model was adequate for policy issues.

The relationship between replacement effort and information or campaigns for eucalyptus (Table 12) showed that if the level of information increased by 100%, the replacement effort would increase by 21%. However, this information or campaigns did not significantly influence the replacement effort at 0.05 significance level ($t\text{-cal}=1.919$, $se=0.110$, $P=0.057$). This therefore meant that an increase in information about eucalyptus insignificantly increased the replacement effort. The R^2 value of 0.024 showed that, only about 2% variation in replacement effort was explained by information on eucalyptus. This implied that other factors are required. This goes to buttress the increasing dynamism of the perceptions and attitudes of the Bui citizens as far as eucalyptus replacement is concerned.

Table 12. Research Question 3; Do communities access campaigns for eucalyptus tree replacement and do these campaigns influence their choice of plantation?

Dependent variable: Eucalyptus tree replacement effort				
Method: Least squares ; Included observations: 150				
Variable	Coefficient	Std. Error	t-statistic	Prob
C	0.059	0.104	0.566	0.572
Information on eucalyptus	0.212	0.110	1.919	0.057
R^2	0.024			
R^2 -Adjusted	0.018			
S.E of Regression	0.429			
F-statistics	3.681			
Prob (F- statistics)	0.057			

Source: *Authors' Field work (2015)*

Table 13. Research Question 4; Is education a factor that influences citizens’ attitude as regards agricultural land use choice?

Dependent variable: Eucalyptus tree replacement effort				
Method: Least squares				
Included observations: 150				
Variable	Coefficient	Std. Error	t-statistic	Prob
C	-0.108	0.098	-1.105	0.271
Educational status	0.151	0.039	3.862	0.000
R ²	0.092			
R ² -Adjusted	0.085			
S.E of Regression	0.414			
F-statistics	14.916			
Prob (F- statistics)	0.000			

Source: Authors’ Field work (2015)

The relationship between education status and replacement effort as presented in the table was significant (S.E=0.039, tcal=3.862, P<0.05) (Table 13). This means that education level of respondents significantly affected replacement effort positively and a 100% increase in the level of education was likely to increase replacement effort by 15%. The R² value of 0.092 showed that 9% variation in replacement effort was explained by education level. These findings showed that education level is an important factor influencing replacement effort; however there are other factors influencing replacement as indicated by R² value of 0.092.

Table 14. Research Question 5; Does income received by citizens’ play a role in the choice of agricultural land use?

Dependent variable: Eucalyptus tree replacement effort				
Method: Least squares Included observations: 150				
Variable	Coefficient	Std. Error	t-statistic	Prob
C	0.119	0.066	1.809	0.072
Income	-0.177	0.078	-2.285	0.024
R ²	0.034			
R ² -Adjusted	0.28			
S.E of Regression	0.427			
F-statistics	5.223			
Prob (F- statistics)	0.024			

Source: Authors’ Field work (2015)

The results in Table 14 showed that the economic value of eucalyptus or income received by citizens was significantly negatively related to the replacement effort and if incomes received by the citizens' increased by 100% there was likelihood of replacement effort to decrease by 18%. Further, the t-value of 2.285 and probability value of 0.024 compared with table t-5% critical value of 1.960 and chosen 0.05 level of significance, confirmed the significance of economic value to the replacement effort. However, only about 3% variation in replacement effort was being explained by economic value, meaning that there were other factors influencing replacement effort apart from the economic value.

8. The Prospects / Way Forward

The future prospect and sustainability of the eucalyptus replacement programmes in Bui Division rest on proper cost-benefit evaluation of eucalyptus plantations. Consider that 1ha of land is cultivated with eucalyptus and the same surface area is cultivated with an annual or biannual crop such as potatoes, maize, beans or groundnuts, a typical eucalyptus tree takes about 10 years to mature to the point at which it can be used for electricity poles. Each pole is sold between 1,500 to 2,500FCFA. Considering a minimum planting distance of 4 x 4 metres, it therefore means that 1ha will conveniently harbour 1,000 trees. Sold for this amount, therefore the farmer expects 1.5 million or 2.5 million FCFA in 10 years.

Consider that the same piece of land is subjected to annual or biannual food crop production using the typical rainfed agricultural system, the farmer produces potatoes, maize, and bean, which are important determinants of food security or self-sufficiency. Considering that mixed cropping is the predominant farming system in Bui Division and most agriculturally endowed rural areas of Cameroon, the farmers expect annual income from the sale of one or more products. This adds to the farmers' annual income.

Most importantly, food crop production leads to food self-sufficiency, better living conditions and improved health status. As a result, the farmers can directly rely and be sustained by their food crops. Furthermore, once there is integrated farming incorporating both crop production and the tendering of livestock, the livestock, most especially ruminants and birds, act as a safety net in times of need. Therefore, the income the farmers generates in 10 years from cultivating a hectare of land is far greater and significant than the proceeds from the eucalyptus plants, as revealed in this study.

Therefore, why are the citizens adamant or non-responsive to the eucalyptus replacement programmes? The answers lie in ignorance, conservative practices and attitudes, unfounded behavioural patterns and their perceptions, and lack of proper cost-benefit analysis or land economic valuation analysis. Some of these perceptions are rooted in the socio-economic and cultural importance of eucalyptus as uphold by the indigenous populations. To totally discount or

discredit the socio-economic and cultural importance of the eucalyptus is a fallacy. These roles are founded and documented. So too are the numerous environmental implications of planting eucalyptus in marginal lands, which in the final analysis will impose socio-economic negative consequences or repercussions on the population. As such, there is need for proper land use suitability / capability analysis, and zonation of eucalyptus planting zones. Areas in the upstream, which correspond to the major watersheds / catchments and sources of major streams, should be avoided. Rather, these marginal lands should be flourishing with environmentally friendly and water loving tree species.

Therefore, for the Bui citizens to change their negative perceptions and adopt more positive attitudes and behavioural patterns towards the eucalyptus replacement programmes for sustainable development, the socio-economic / cultural importance of eucalyptus have to go in consonance with the environmental impacts. The findings of this study are very relevant and contemporary especially with the much heralded discourse on conservation agriculture, population-environment-livelihood sustenance nexus, afforestation / reforestation, agro-forestry, analogue forestry, just to mention a few. The authors therefore opine that for there to be a radical overhaul of the attitudes, perceptions and behaviour of citizens with regard to eucalyptus replacement programmes as vehicles of sustainable development, there is dire need for sensitisation, capacity building, concerted dialogue and community participation, all based on high level decision making. The citizens should implore their reason and base their actions on effective cost-benefit analysis, rather than on sentiments. The role of the state in establishing and galvanising synergy is of utmost importance.

9. Conclusion

This study aimed at examining the determinants of attitudes of citizens towards eucalyptus tree replacement programmes for sustainable development in Bui Division of the North West Region of Cameroon. The major findings revealed that attitudes of Bui citizens significantly determine their behaviour towards eucalyptus replacement programmes. Amongst these factors, the level of education was the most dominant, followed by income derived by citizens from the eucalyptus tree, then cultural factors followed by campaigns and landownership. The findings of the study revealed that there is a significant relationship between land ownership and eucalyptus tree replacement effort. Men who are designated the owners do not give women the opportunity to put into practice what they learn about this tree type and its negative effects on the environment despite the fact that they are the sole cultivators of land. This result is therefore in line with other studies conducted and which indicate that women have weak land rights which reduces the likelihood that they will invest much time and resources on land or adopt environmentally sustainable farming practices such as tree planting (Food Policy Report – 1995). It was also revealed that cultural uses significantly determine the replacement effort but in a negative way

but that there are other factors that affect replacement effort not captured by this model. Considering the relationship between replacement effort and information or campaigns for eucalyptus replacement, it was also revealed that if the level of information increases by 100% the replacement effort will increase by 21%. However this information or campaigns do not significantly influence the replacement effort. This therefore means that an increase in information about eucalyptus will insignificantly increase the replacement effort. Another finding of the study was that education significantly influenced the implementation of eucalyptus in Bui Division. The education level of respondents significantly affects replacement effort positively and a 100% increase in the level of education is likely to increase replacement effort by 15%. These findings show that education level is an important factors influencing replacement effort, however there are also other factors influencing eucalyptus replacement. Based on the economic factor, the value of eucalyptus or income received by citizens is significantly related to the replacement effort and if incomes receive by the citizens' increase by 100% there is likelihood of replacement effort to decrease by 18%. However, only about 3% variation in replacement effort is being explained by economic value, meaning that there are other factors influencing replacement effort apart from the economic value.

10. Recommendations

There should be the continued implementation of the Prefectorial Order of 3rd February 1998 bearing on the destruction of eucalyptus from all water sources and water tables in Bui Division by all the stakeholders concerned. In order to get the citizens implementing the eucalyptus for native trees the following recommendations are made: To break through the barriers of land ownership, the cultural uses and information dissemination about the eucalyptus plant, more education is needed to be made available to the citizens on the effects of the plant. In this process, proper information needs to be passed to them and this should be accompanied by trainings o how to nurse and plant these indigenou trees for environmental protection and to help rehabilitate livelihoods. These trainings should also be accompanied by the provision of materials and seeds that are not to commonly access by the citizens since the tree species presently occupying the area are the eucalyptus plant. As concerns the educational status of respondents which significantly influence the implementation of the eucalyptus tree replacement programmes in Bui Division of the North West Region, the curriculum of adult learners should include environmental. Appropriate method of teaching should be used to better help the learner understand about the effects of the plant on the environment. With respect to the fact that the income derived through the eucalyptus plant and its products significantly influence citizens' attitude towards implementing the replacement programmes, we therefore recommend that the government and the local government should look for alternative ways that can help boast the living standards of the citizens without necessary depending much on eucalyptus. Based on the

climatic situation of this area, new plants can be introduced to improve on their income. For example, potatoes is one of the plants that do well in this area and fast maturing species should be introduced and organised efforts made for its processing to chips for external markets. A new study can be carried out to find out the effects of eucalyptus plant on the development of women folk in the Bui Division of the North West Region of Cameroon.

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