

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

KUMASI.

THE IMPACT OF THE MODIFIED
TAUNGYA SYSTEM ON THE STANDARD OF LIVING OF FOREST FRINGE
COMMUNITIES IN THE SUB-HUMID FOREST ZONE OF GHANA

BY

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PHILOSOPHY DEGREE IN AGROFORESTRY

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DECLARATION

I declare that except references to other people's research which have been duly cited, this thesis submitted to the school of graduate studies, Kwame Nkrumah University of Science and Technology, Kumasi for the degree of Master of Philosophy in Agroforestry is my own investigation.

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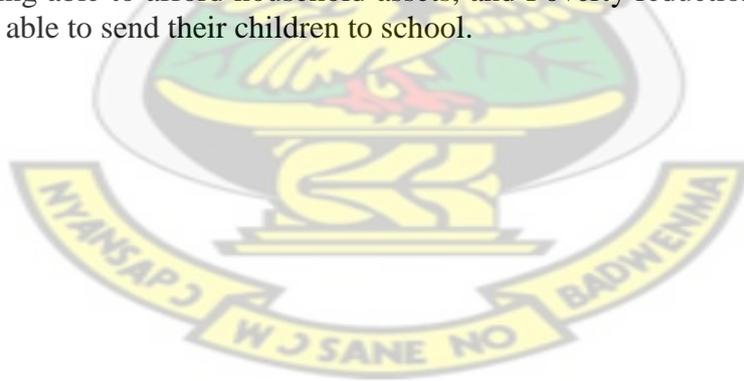
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ABSTRACT

Ghana's forest has decreased from 8.2 million ha from the 1900 to 4.94 million ha in 2000 due to high rate of deforestation. This is attributed to factors including excessive and illegal logging, unsustainable agricultural practices, bush burning, mining and quarrying, settlement and related infrastructural construction and urbanization. Widespread poverty in the forest fringe communities has been identified as a consequence of forest degradation. The Modified Taungya System (MTS) was introduced as a means to arrest the rate of deforestation in the country and to enhance the socio-economic livelihoods of the forest fringe communities. The study evaluated the impact of the modified taungya system on the livelihood of participating forest fringe communities in the National Forest Plantation Development Programme (NFPDP) of the Forestry Commission. It also evaluated the degree of success of this system as means of afforestation, and increasing food production in the sub-humid forest zone of Ghana. An interview survey was conducted in which data was collected from 360 randomly selected farmers in four forest districts: Offinso, Kumawu, Nkawie and Bekwai in the Ashanti Region of Ghana. A total of twenty communities were randomly selected with eighteen respondents from each community. The farmers were predominantly illiterate, within the age of 35-54 years and with small farm holdings. About 81% relied totally on food from the forest reserve for their livelihood, while 71% also had farm holdings in off reserve areas. Land within the reserve was allocated to farmers free of charge but compensation is paid to landlords on land from off reserve. A statistically significant difference ($p < 0.05$) was observed between produce from the two sources of farmland i.e. from the Off Reserve and the Forest reserve for the households. The study confirmed the modified taungya system has been able to achieve its stated objectives in the area by: increasing food supplies, evident by 69% of respondent being able to meet family food needs at least 10 months in a year, employment as it offered about 900 jobs in the study area, and Improvement in livelihood 67% reported being able to afford household assets, and Poverty reduction, as about 60% of the respondent is able to send their children to school.



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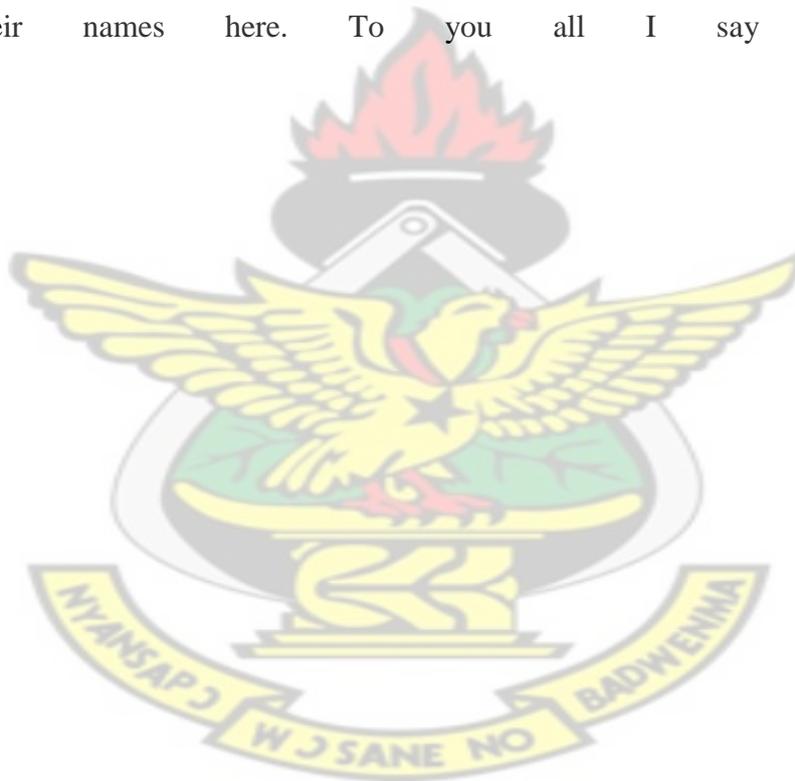


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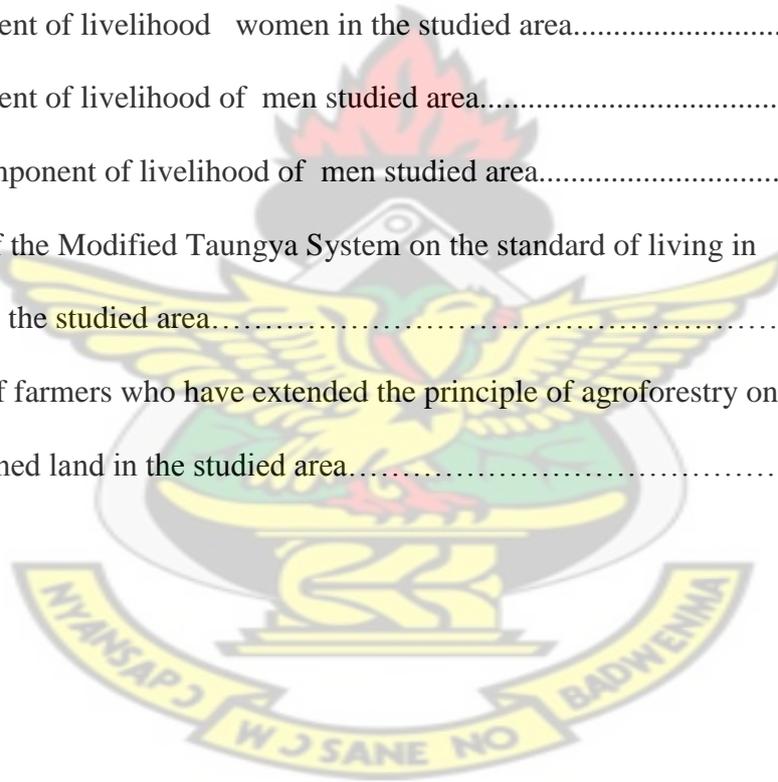
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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND AND JUSTIFICATION

1.1.1 The Forest Resources of Ghana and its Benefit

Ghana's total forest zone is about 81,342km² and about 17,845km² of this is under reserve. The reserved forest is made up of 11,590km², production forest 4,323km² of production forests and about 1,980km² of game production reserve (Siaw 2001).

The natural vegetation cover of Ghana is closely linked to the rainfall pattern. The major vegetation formations are the closed forest, northern savannah, coastal savannah and the coastal strand and mangrove formation. The country is roughly divided into the High Forest zone (HFZ) in the south, accounting for a third of the land area and the Savannah Zone in the north, accounting for the remaining two-thirds. The closed forest zone contains high value redwoods and other species of commercial importance.

Ghana's forests make up part of the Guineo-Congolese phytoecological region. Within the High Forest Zone (HFZ), there are six main types of forest; dry semi-deciduous, upland evergreen, moist semi-deciduous, moist evergreen, and wet evergreen, southern marginal, and southeast outlier. A woodland savanna mosaic predominates across the middle belt of the country, becoming a grassland savanna in the north. Mangrove forests, wetlands, and swamp forest systems are found along the coastline.

Ghana has 266 protected areas, the majority of which are classified as forest reserves and national parks. These protected areas cover 25,559 sq km, of which 16,788 sq km are in the

high forest zone. Biodiversity is high in some of these forests, and Ghana's HFZ falls within the West African Biodiversity Hotspot, as identified by Conservation International. Despite the extensive cover of forest and wildlife reserves, the majority of forest reserves are partly to mostly degraded GFIP (2012).

1.1.2 Benefit of the Forest Resources to Ghana

The Forest resources are of great importance to millions of people, especially those whose livelihood largely depends on them. These resources play a key role in protecting the environment and are of tremendous importance to the sustainable development of every country.

Agriculture including forestry is the backbone of the Ghanaian economy. It provides 43% of the Gross Domestic Products, 50% of export earnings and 70% of total employment. Forestry as a sub-sector accounts for 6% of the GDP, 11% of export earning and employs a labour force of 100,000 people (FOSA Country Report-Ghana).

Most of the rural population depends on the forests for their survival as forestry has played a significant role in the provision of food, clothing, shelter, furniture, potable water supply sources and bush meat. The forests are also highly valued as sources of natural medicine, which are essential components of health treatment which is commonly used in conjunction with mystical and ritual practices. The timber industry is the third most important foreign exchange earner of the country .It is one of the fastest growing manufacturing units in the country and generates more employment and income to a majority of Ghanaians.

Forest policies and resources management in Ghana dates back to 1906 when legislation was enacted to control the felling of commercial trees species and the creation of the Forestry

Department in 1908. The demarcation and reservation of the forest estate was largely completed by 1939 and a forest policy was adopted in 1948 (Ghana Forestry Commission). Since then a consistent policy of selection, demarcation, reservation, protection of water supplies, maintenance of favorable for cultivation of agricultural crops and the promotion of research and public education have been vigorously pursued. As a result the government in 1978 placed about 3,267,250 ha of forest under permanent estate.

1.1.3 Challenges encountered with Forest managements leading to reduction in forest resources

Recognizing the importance of forest resources and the need to for appropriate measures to optimize their management and utilization in Ghana, successive governments formulated policies for developing a national forest estate and a timber industry that guarantees a full range of sustainable benefits for the population. Notable among them are Forest Commission act of 1960, forest improvement fund act of 1960, concession Act of 1962 Forest Ordinance for the protection of forest s including reserves of 1972. Trees and timber (Chain saw operation regulation of 1983, Trees and Timber (Chain Saw Operation) Regulation Of 1994. These policies and related laws were to be implemented by the various agencies responsible for forest management in Ghana .However, most of the forest policies have failed to address the fundamental challenges of forest management in the country. Their implementation with all the associated reforms could not halt the degradation in the forest resources base (www.fcghana.org).

Many managed forest reserves are without management plan. As a result illegal chainsaw and mining operations in forest areas have thrived over the years despite conscious national

efforts to curb the situation in collaboration with security agencies. The timber industry still operates with obsolete equipment and has installed capacity exceeding the Annual Allowable cut (AAC) (www.fcghana.org). Originally Ghana's forest covered about 36 % (8400km²) of the total land area of Ghana (EU, 2006). However, most of the early forest policies mainly emphasized a sustained supply of timber for the wood industry and promoted over exploitation and an eventual demise of unreserved forests and also, the uncontrolled and unsustainable methods of harvesting natural resources being employed by forest resources exploiters, investors, government agencies, individual community members and illegal chainsaw operators have reduced the forest resources to about less than 25% of its original value and now exist in fragmented patches estimated to be about 20 to 524km² (Boon *et al* 2008).

The Forest Service Division (FSD) has since the late 1930s been involving communities in plantation establishment through the taungya system, (Taungya is a forestry system that involves inter-planting trees with agricultural crops, particularly the local population's staple foods, and so serves to satisfy the farmer's quest for arable land (FAO, 1984)). About 75% of Ghana's current total areas of commercial public and private forest plantation of 35000 ha were established using the taungya system (Agyemang *et al*, 2003).

The Forest Service Division (FSD) the then Forestry Department (FD) could, however, not sustain the pace of planting due to the host of reasons, most notably the lack of resources and continued failures in establishment due to poor supervision and poor incentive schemes (Agyemang, *et al* 2003).

Ghana's forest has been diminishing at a geometric rate (1.68% per annum FAO 2010) at the expense of the forest fringe communities' livelihoods and development it was feared that it may not be able to meet the needs of future generations (Boon *et al* 2008). It is estimated that out of the total 1.6 million ha of the high forest zone about 400,000 ha (24%) is degraded (less than 5m²/ha basal area of forest cover) and cannot naturally regenerate and thus will require reforestation. Additional 122,000 ha (8%) require some form of rehabilitation such as enrichment planting. In the off reserve; an estimated 400,000 ha of the land may also require rehabilitation or reforestation (Agyemang, 2001).

In an attempt to improve and therefore boost the reforestation programme the then President of the Republic of Ghana, re-lunch the National Plantation Development Programme (Modified Taungya System) on September, 2001, with an annual planting target of 20,000 ha. The establishment is in collaboration with local communities to create jobs in rural communities' thereby reducing poverty levels, and increase food production. The MTS is a decentralized mechanism to halt and reverse degradation of forest resources as well as build community resilience for enhanced rural livelihoods and poverty reduction (Adjei and Eshun 2009).

1.2 PROBLEM STATEMENT

According to Agyemang (1993), forest reservation appears to have had little effect on the socio-economic conditions of communities living near reserves; there is no difference in income between areas near to and distant from reserves. These forest fringe communities according to Donkor (1997) are where poverty is concentrated in Ghana. Information from the 1987-88 First Ghana Living Standards Survey (GLSS 1) indicates that the poor are

predominantly engaged in agriculture and are thus rural based. In 1984, the farming population that fell below the poverty line was 67.3% and this declined to 54% in 1986 (GLSS 1, 1989). The introduction of the Modified Taungya System (MTS) came as a relieve to the forest fringe communities as they saw it as means to benefit from the Forest if only the stated objectives were to be obtained.

After over a decade of the MTS implementation, its viability to achieve or deliver livelihood security, forest resource recovery, and poverty reduction at the local arena require monitoring and verification hence the need for this study. According to Opoku, (2006) poverty is endemic in the forest fringe communities and at the end of the study it will be found out if poverty level at the forest fringe communities have reduced and the stated objectives of the Modified Taungya System have been achieved, and if there is a more cost effective way of achieving them and how to improve on the achievements, it will be communicated to the policy makers. If it is found out that the objectives have not been achieved, appropriate recommendations will be given as to how to achieve them in a cost effective and efficient manner.

1.2.1. Hypotheses

The research hypotheses were that,

1. Modify Taungya system has enhanced the livelihood (the capabilities, assets (including both material and social resources) and activities required for a means of living”) of the forest fringe communities/ participating farmers
2. Modify Taungya system has increased food production

1.2.2 Objectives

The objective is to find out

1. The contribution of the MTS on the enhancement of the livelihood of the farmers participating in the MTS.

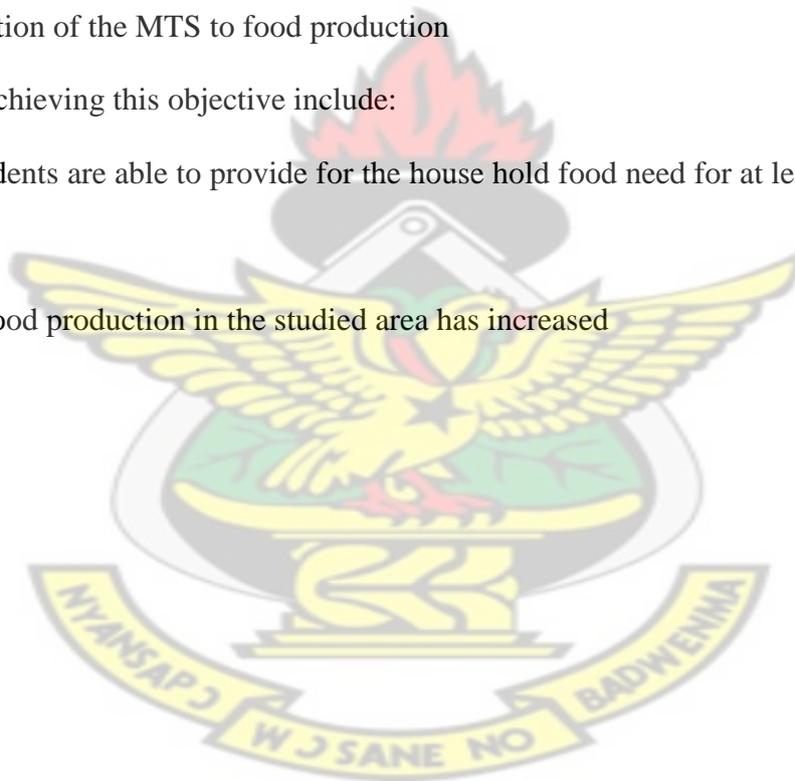
Indicators for achieving this objective are:

- a. Respondents/ farmers are able to purchase basic household item,
- b. Respondents are able to send their children to school and
- c. Respondents able to engage in other income generating activities

2. The contribution of the MTS to food production

Indicators for achieving this objective include:

- a. Respondents are able to provide for the house hold food need for at least 10 months in a year
- b. When food production in the studied area has increased



CHAPTER TWO

LITERATURE REVIEW

2.1 DRIVING ENGINES AND FACTORS OF CHANGE IN THE FORESTRY SECTOR

2.1.1 Driving Forces and Factors of Change

Forests have since ancient times played an important role in the lives of people and environment in general. Forests provided and continue to provide numerous benefits to humanity. Human activity and technological developments are, however, posing a threat to the sustainability of forests and the subsequent benefits of forests. The rapid degradation of natural resources through human activities and other developments have resulted in doubts about the continuous availability of the benefits, particularly to future generations (Sackey 2007).

Socio-economic consideration drives land- use and forest management decisions. The most common impetus for land use change is conversion from a less profitable option, such as forest/forestry, to more profitable one, such as agriculture or animal husbandry. The difference in profitability is real, at least in the short term, but often agricultural subsidies or other policies that favour agricultural expansion cause this profit disparity (Indufor 2010). The driving forces of deforestation include:

- Excessive and Illegal Logging
- Unsustainable Agricultural Practices
- Bush Burning
- Mining and Quarrying
- Settlement and Related Infrastructural construction
- Urbanization

2.1.2 Excessive and Illegal Logging

The harvesting of timber is the most important single factor contributing to deforestation in Ghana (FAO 2003). However in 1991, logging operations accounted for only 14% of the deforested area in Ghana (FSD Annual Reports – 1962-94). Outside the Forest Reserves logging has been on the increase mainly due to lack of effective control.

According to FOSA (2003), Illicit logging activities due to poor supervisory role of the Forest Services Division are also having a serious toll on the timber resource base of the country. The actual timber harvest in 2005 is estimated to be 3.3 million m³ of roundwood, which is more than three times the officially recorded harvest of 935,000 m³. Accordingly, 70% of the harvest is illegal because it is not recorded. The formal sector used about 1.6 million m³, and the informal sector (chainsaw operators and cottage dimension mills) used approximately 1.7 million m³. (FC. VLTP 2007). The Division lacks resources and logistics to adequately monitor timber operations and to ensure that timber contractors comply with the provision in the logging manuals.

2.1.3 Unsustainable Agricultural Practices

According to the United Nations Framework Convention on Climate Change (UNFCCC), the overwhelming direct cause of deforestation is agriculture. Subsistence farming is responsible for 48% of deforestation; commercial agriculture is responsible for 32%, logging 14%, and fuel wood 5% of deforestation (UNFCCC 2007).

According to FAO (2001), the area of land under agriculture increases every year due to the extensive (bush fallow/slash and burn) system of farming practiced in the country. The traditional bush fallow system of cultivation involves slash and burn of forest and grassland.

The basic principle of slash and burn agriculture is to alternate lands between crop production and native vegetation. During crop production without fertilizer additions and good soil management practices, soil quality and crop yields decline over time. When crop yields decline to unacceptable levels, the fields are abandoned, and re-growth of native plants restores soil quality over time. Once the soil quality is restored, the native vegetation can be cut and burned to release nutrients back into the soil for crops. Dillaha (2010) explains that this system works well when there is ample time for native vegetation regrowth, typically five or more years for each year of cropping. But population increases and food needs have decreased the period of the cycles so much that slash and burn is no longer effective. However, long fallows necessary for the forest to regenerate fully is only possible if population growth and pressure on the land are low. With increasing national population over the last two decades, there has been agricultural expansion which is among the greatest contributors to deforestation. Such expansion is sped by slash and burn agricultural practices which is the main method of farming in the country.

Although there are limited empirical data on the extent of deforestation, specific location and acreage, Agyemang and Brookman – Amissa (1987) attributed 70% of deforestation to shifting cultivation (bush fallow). According to the World Bank (2006), more than 50 percent of the original forest area of Ghana has been converted to agricultural land by clearance for perennial or annual cropping and slash-and-burn cultivation practices.

2.1.4 Bush Burning

Forest fire has been the immediate cause of most forest degradation in the country over the last few years. According to data gathered over the years, every year about 30% of the forest

areas are destroyed by fire (FAO 2001). Bushfires occur annually in the dry season usually from November to March.

The causes of bush fires are both intentional and unintentional. Intentional fires, called early burning are used as a management tool to reduce the ferocity of late dry- season fires in vegetation near the forest-savannah boundary. Though this management practice has been in use since time immemorial, it has a negative influence on forest regeneration and contributes significantly to deforestation (FAO, 2001). Unintentional fires result from activities of hunters and others who may fail to extinguish campfires.

More than one million m³ of exportable timber have been lost to fire over the years. Burnt forests are dominated by pioneer trees of little economic value and are more prone to burn in the future. Fire is the greatest threat to the long-term survival of half the forest in Ghana. Fire prevents forest from developing into primary forest and records indicate that only 20% of the forest zone is currently covered by forest which has not been burnt regularly (Hawthorne, 1994).

2.1.5 Mining and Quarrying

Most of the mineral belts in Ghana with geological information are located south of latitude 8° north and this is the area where mining activities are most concentrated. Incidentally this is the area within which the forestlands are located. According to national development policy, Ghana intends to place 2% of its production forest reserves under mining.

Most of the mining operations are surface based and contribute to;

- Destruction of vegetation including economic trees and cash crops

- Destruction of water resources and watershed from the forest environment
- Pollution of sources of drinking water for the rural people (FAO, 2000).

Open cast mining activities for gold and diamond, especially those by the small-scale operators and large scale mining for bauxite, manganese and gold, pose serious threat to forest in the forest regions of Ghana. Iron ore extraction around Awaso (Afao Hills) and bauxite mining at Atewa and Tano-Ofin and surface mining in the western and Ashanti Regions are threats to the forest.

Layout of mines and infrastructure (including waste dumps, storage, tailings ponds, plant yards, roads and accommodation) is destroying large areas of forestry reserves. Gold mining has been cited as the greatest threat, particularly to forest reserves in and near the genetic “hotspots” of the wet evergreen zone (FAO 2000).

2.1.6 Settlement and Related Infrastructural construction

The construction of roads to access logging, oil, and mining sites in the rainforest opens vast stretches of forest to exploitation. Generally these roads are funded by governments and development agencies, but some are also financed by private development interests. One of the most famous projects is the Trans-Amazonian highway in Brazil, which opened up the Roraima state to widespread invasion and deforestation by miners and colonists, (www.mongabay.com).

2.1.7 Urbanization

Urban and residential area expansion cause significant forest loss, both in the consumption of building materials and as a source of land. While urbanization can sometimes reduce

pressures on forests by the migration of rural residents to population centers, urban and suburban sprawl can be damaging when they occur in frontier settlements and boomtowns. A single gold or gem find can quickly swell a population of a remote forest outpost as a sea of prospectors rush to the area in hopes of finding riches (www.mongabay.com).

2.2 UNDERLYING CAUSES OF FOREST DEGRADATION

FAO defines deforestation as "the conversion of forest to another land use or the long-term reduction of the tree canopy cover below the minimum 10 percent threshold." Depletion of forest to tree crown cover greater than 10 percent (say from 90 percent to 12 percent) is considered forest degradation.

As noted in the previous sections, forest depletion and degradation is the effect of complex interactions between social, cultural, political and commercial factors. Some of these are as discussed below:

2.2.1 Lack of Stakeholder Participation in Forestry Management

FAO defines Participatory forestry as the processes and mechanisms that enable the people who have a direct stake in forest resources to be part of decision-making in all aspects of forest management, from managing resources to formulating and implementing institutional frameworks. On the other hand, community forestry refers to a component of participatory forestry that focuses on local communities as key stakeholders for sustainability.

According to Fisher *et al.* (2000) more often than not, the views of local communities on forest management are not systematically elicited, evaluated, and incorporated in the decision-making processes. Long-standing poor public relations is a salient feature shared by

many developing countries in forest governance and, therefore, minimal support from local communities in forest management (Kideghesho *et al.* 2006).

For many years, forest policy has been based on the notion that local forest users were ignorant and destructive. The State authorities in capital cities, responsible for policy-making, looked down on the knowledge and capacities of the indigenous people in the community. These authorities overlook the forest users the most interested party in the sustainable management of the forests as it is their source of livelihood (World Rainforest Movement 2002). For example, in the consultative process in Ghana that led to the development of 1994 Forest and Wildlife Policy, (Kotey 1998) there was under-representation of traditional rulers, farmers or members of the communities living near, using or dependent on forests. A major contributor to Ghana's deforestation has been the alienation of forest communities from policy formulation although such communities were expected to help in protecting the forests (MLF 1996).

According to World Rainforest Movement (2002), these indigenous people have rich tradition in forest management base on parameters that are different from the predominant community based objective conservation model.

The concept of community forestry is a forest management approach in which local communities are empowered and grassroots organizations strengthened and charged with the responsibility for the stewardship, management and reaping of benefits from forests and forest resources. This concept can be broadly referred to as the efforts of communities who are motivated by a common purpose to manage and protect local forests for economic, social, cultural and environmental benefits (World Rainforest Movement 2002).

The 1994 Ghana forest and wildlife policy was aimed at the conservation and sustainable development of the country's forest and wildlife resources for the maintenance of environmental quality and the perpetual flow of optimum benefits to the whole society. The purpose of the policy was to promote public participation in the share of benefits and responsibilities in forest management and encourage integrated and coordinated research in forest related issues.

In Ghana most rural communities live very close to the forest and are major and direct consumers of the goods and services from the forest; especially the non-timber forest products. These communities are the major and direct cause of deforestation and other forms of ecological and environmental damages, but forest policies in Africa have further kept the local population away from the forest resources (Ardayfio-Schandorf *et al.*, 2007). This alienation has made local communities lose self-image as trustees of the forest resources in Africa (FOSA, 2003) and criminalization of their practices perpetrated on grounds of safeguarding the ecological integrity of forests (Bonner, 1993).

There is evidence that the rate of deforestation has seemingly declined since the concept of community participation in forest management was introduced about a decade ago (FAO 2001). This reduction in deforestation may be due to the fact that people take more measures individually to protect the forests from illegal logging and fires. Increasing awareness of how many species have become endangered and the importance of the forests may have contributed to the protection of the forest.

2.2.2 Low Forest Taxes and Fees Regime

Forest revenue is generated mainly through royalties, rental fees and silvicultural charges. From the economic point of view, often in the timber industry, a substantial residual

economic value remains (before tax) after accounting for production costs and imputing sufficient profit to sustain the enterprise over the long term. This residual value or stumpage value in reference to the value of the standing timber is the maximum price a logger would be willing to pay under competitive condition to the government. If the government leaves a large proportion of the stumpage uncollected, pervasive economic incentives set in to influence the rate of log harvesting. Thus the forest revenue regimes have a critical role in determining the rate of environmental decay (FOSA 2003).

The Forestry Commission faces problems in fully capturing the tree information data which form the basis for invoicing stumpage fees. In addition, low efficiency in collection of invoiced stumpage fees has resulted in cumulative stumpage arrears of ₵44 billion (status 1 January 2006). Since their introduction in 1999, stumpage fee rates have been revised only in April and July 2003, meaning that the real value of fees has been considerably eroded by inflation from 1999 to 2003, Forestry Commission Validation of Legal Timber Programme Paper No. 3. (FC, VTLP. 2007).

The contribution of forests to local livelihoods and the Ghanaian national economy as a whole is significant, but is largely unrecorded and consequently unrecognized (World Bank 2006). Many transactions related to forest products and services fall within the informal sector or are undertaken illegally and are, hence, not recorded. Official Gross Domestic Product (GDP) figures, on which the analysis of economic growth is made, do not reflect the “true” economic importance of the forest sector to the national economy (World Bank 2006). This “undervaluation” matters because the contribution to GDP and its growth determines decisions made by the government of Ghana, and also to some degree its development partners, regarding the allocation of financial resources.

The forest sector has a huge potential for collecting forest revenues from licenses and permits, but the majority of these revenues go uncollected due to corruption. Particularly at revenue collection waypoints on public highways, the low salaries and poor supervision of government staff result in diversion of significant revenues for private gain. Forests and woodlands are recognized as an important resource base for Ghanaian social and economic development, and for provision of many basic benefits and opportunities to rural and urban communities. Values of forest goods and services, however, are often underestimated, wrongly attributed to other sectors, or entirely omitted. These include non marketed timber, non-timber forest products, forest products harvested illegally (possibly up to 80 percent of all forest harvesting), tourism and recreational services, and ecosystem services such as positive influences of forests on agricultural production, water quantity and quality, energy sources, carbon storage, and biodiversity protection.

According to FOSA (2003) the Ghanaian forest authorities have frequently established inappropriate forest revenue systems in which the timber royalties do not cover the cost of managing the forest. The forest fees do not cover the full economic cost neither does it cover the full operating cost. Until recently, timber royalties were charged per tree and value was estimated at less than 2% fob price per m³ of round log multiplied by the average tree volume of the species at the minimum felling diameter. The logger's liability was assessed from the yearly log production compiled by the Forest Products Inspection Bureau. The system is inefficient as a mechanism for covering stumpage value, thus promoting wastage both in the forest and mills (FSD 2004).

An analysis of the forest fees in Ghana show that forest fees have been too low in absolute terms to protect the resource or slow down exploitation. The current system has resulted in an

inadequate market incentive differentiation between species, thus leading to over-exploitation of abundant but less-desirable species.

2.2.3 Weak Institutional Structures

The failure of the Forest Authorities to adequately control and manage the forest sustainably has resulted in large-scale encroachment on the forest reserves. Weak administrative machinery to monitor and patrol the forest reserves is also an underlying factor for increasing bush fire in the forest areas. The weak administrative machinery may also be the result of inadequate funding for the operations of the forest authorities.

The weak administrative machinery is often a measure of the gap between projected revenues and what is actually collected, or the ability to generate enough revenue to cover the cost of operation. The income generating ability of the Forest authorities determines the efficiency in managing the forest. Until 1998, the FSD was able to collect less than 58% of its potential revenue due to be collected (Baah -Wiredu 2006). The service was therefore unable to cover the full cost of forest management. It could not acquire the basic equipment needed for forest management and monitoring. This gave rise to widespread illegal timber operations across the country.

2.2.4 Lack of Investments in the Forestry Sector

Investments in the forestry sector can have an indirect effect on the forest. Where people fail to invest in timber plantations, it exerts undue pressure on the natural forest since demand of the installed milling capacity exceeds the supplies from the forest. In the past the private sector failed to invest in the timber plantations for almost a century and the natural forest continued to be the source of raw materials for the over-capacity milling industry.

According to Appiah (1996), the long gestation period of growing trees, the insecurity in the land tenure system, unwillingness of the financial institutions to lend money for such ventures, and or the non-concessionary interest rate, are responsible for the low investment in plantation. Uncertainties in marketing, cultural attitudes, lack of education on the prospects of commercial tree cropping and the lack of safeguards for full user-right of the product are also responsible for the low investment.

Public policy in most developing world has also aggravated the situation for not given much attention to commercial tree planting partly due to budgetary constraints and partly due to the belief that the natural forest has the capability to sustain the wood requirements of the society and also maintain environmental stability. According to Appiah (1996) there are doubts on the ability of the natural forest to perform these multiple functions.

Most overseas demand is for kiln-dried products and Ghanaian manufacturers lack sufficient kilns to meet that demand. By the early 1990s, there were approximately 220 lumber processors in Ghana, but the industry operated under several constraints. Foreign investment incentives are not as attractive in this sector as in others, such as mining. Furthermore, infrastructure in the Western Region where lumber processing is located continues to be relatively neglected compared with mining and cocoa production regions. Other challenges contributing to lack of investments in the forestry sector included lack of expertise at technological and managerial levels.

2.2.5 Population Pressure

FOSA (2003), states that Rapid population growth is one of the root causes of poverty and forest resource degradation in Ghana. The rapid population growth since independence,

coupled with internal migration, also accounts for the high rate of forest degradation. In most parts of the country especially in Western, Ashanti and Central regions as the population density increases and land becomes scarcer, land value rises and farmers then find it cost-effective to intensify production. Others resort to clearing virgin forest for additional cultivation of cocoa. The poor and landless peasant farmers tend to be pushed onto ecologically sensitive areas with low agricultural potential (for example semi-arid savanna, erosion-prone hill sides and tropical forests). The situation is aggravated where large-scale farmers respond to growing pressure to expand primary commodity export like cocoa and cashew and thus enlarge the areas on which cash crops are grown. Related to population growth is the growth in urban settlement and a changed urban land use pattern. The growth in urban population means an increase in demand for land for constructional purposes.

2.2.6 Policy Implementation Failures

Another stream of factors responsible for the forest degradation in Ghana is policy implementation failures. The traditional approach to solve environmental problems is for the public authorities to promote natural regeneration programs and activities controlling pollution. When the policy to promote natural regeneration fails, the rate of deforestation stands out glaring. Most of the natural regeneration efforts that were started, failed due to ill planning, uncoordinated efforts and lack of resources (FOSA 2003).

For example, the failure of the Taungya system in the reforestation strategy in the mid-1970s accounts for the large track of degraded forestlands in the transitional zone. Under the taungya system, farmers were allowed to cultivate food crops in forest reserves while the forestry authorities planted timber trees. However, due to poor supervision and unclear terms

and conditions regulating the operations and the farmer's failure to nurture the trees resulted in large degraded areas (FOSA 2003).

According to Lambert (1999), there is no doubt that Ghana's forest policies, legislation and its enforcement have been a major contributing factor to the rate of deforestation in the country. Until 1994, detailed, clearly defined forest policies specifying goals, objectives and strategies for development of forest and the future direction of the timber industry were not in existence (MLF 1996), despite the 1948 forest policy. This was surely a recipe for disaster in forest management.

The 1948 policy which remained in force for nearly half a century has had a pronounced impact on forest and people. Emphasis was on protection and management of the reserves with the implicit expectation that all forests outside the permanent forest reserves will ultimately be converted to agricultural land. In this way there was a systematic removal of all known timber species before farmers were allowed to farm. The forest policy adopted in 1948 can in retrospect be said to be a generalized statement of intent; bones without meat. This is perhaps due to the fact that the measures required to implement the policy were not explicitly made a part of the policy, neither was there any firm commitment from the state to provide the resources required for such implementation (Lambert 1999).

The 1980s witnessed a failing in the policy and legislation and general public outcry and discontent about the 1948 forestry policy. These frustrations led to some in-house Forestry Department review exercises beginning around 1984 (Lambert 1999).

2.2.7 Poor Institutional Coordination

Although the activities of some agencies in the other sectors of the economy like agriculture, mining, road infrastructure and population have direct impact on the forest resources base, yet there are no mechanisms for coordinating the activities of these agencies. Lack of effective coordination and communication between these agencies and institutions has resulted in increased assault on the forest resource base, which has contributed to its degradation (FAO, 2001).

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2.3 TAUNGYA SYSTEM

Taungya is a land use management system which consists of the raising of forest crops in conjunction with temporary agricultural crops in which a short phase of food crop production is used as a silvicultural method to ensure the establishment of timber trees (Wiersum, 1982). Taungya system is a system of plantation establishment in which willing shifting cultivators are engaged to establish and tend tree crops together with temporary agricultural crops (Kio 1972). However, it is worth noting that taungya system and shifting cultivation are essentially two different land use systems both in time and space. While shifting cultivation is a sequential system of growing woody species and agricultural crops, taungya consists of the simultaneous combination of the two components during the early stages of forest plantation establishment. According to Watson (1983), taungya system is considered as a low-cost mechanism of governments for forest plantations development that engages farmers who are willing to plant and care for forest crops whilst being allowed to grow food crops in between the young tree crops for two to three years. Thus, Taungya is a land use system in which peasants are allowed to cultivate agricultural crops for the first few years between the planted seedlings of forest plantations.

Farmers raise food crops while the forest trees are still young. After 2-3 years, depending on the tree spacing and species, the canopy closes, and light demanding annual crops can no longer be planted. The culminating vegetation is a pure tree plantation. Farmers then move to other open areas to repeat the process.

2.3.1 History of the Taungya System

The introduction of the taungya system into the humid tropics was a response to various socio-economic factors. For example, in Nigeria a major objective was to solve the problem of high cost of forest regeneration (Enabor,1979) In the Nigerian teak plantations, establishment costs to the third year in high forests cleared and burned but not farmed, and planted at 8 X 8 feet (2.5 X 2.5 metres), are about £30 per acre (U.S. \$207 per hectare), equivalent to 100 man-days per acre (247 man-days per hectare) excluding overheads, compared with £15 per acre (U.S. \$103 per hectare) in taungya plantation Lamb (1967). In Ghana, the objective was to solve the existing land hunger problem in the rural areas (Brookman-Amisah1978). Whatever the reason for introducing taungya, King (1968) had noted that successful establishment and development of taungya depended on the pre-existence of land hunger, unemployment, and low standards of living among the rural communities. Apart from these three prerequisites, he noted that other socio-economic factors contributing to the development of taungya include population growth, land availability, farm labour supply, food supply, income-generating potential, availability of infrastructural facilities and organizational institutions.

Lamb (1967) also gave the circumstances under which Taungya as method of regeneration may be successful .They are summarized as follows:

1. Farmers must fully understand what is expected of them and what is expected of the forest officer, and each must trust the other. They must agree that the bargain is fair to them and that the return they get from the site offered will recoup them for the labour of clearing the forest. Many forest authorities have drawn up agreements and required the farmers to sign them before being given a farm. This is a waste of time if the farmer understands and trusts the forest officer. All that is needed are two things: (a) a map showing the current coupe and the subdivision in it of each farm on which the farmer's name is written; and (b) a list of farmers with the record of their past efficiency as farmers. The latter may be called a reputation list. If a farmer does not cooperate one year, he gets a smaller farm or no farm the next; if he does well and wants a larger farm, he gets one.

2. The forester must adjust his planting techniques and selection of species so as to meet the farmer halfway. The attitude should be one of understanding and enquiry, to achieve the maximum degree of integration between farm and forest interests.

3. The system is more likely to be widely accepted where the farmer is unable to maintain soil fertility by any other system than bush fallow. This occurs where the soil is sandy and the rainfall high. The best example is the Benin Sand formation in Nigeria, but the taungya system has worked on waterlogged white sand sites in Trinidad where pine was being planted and on more fertile areas where teak is the timber tree being established. In the Philippines, on the other hand, this system could not be operated because the soil retained its fertility for a long time and the farmers that refused to move were supported in their refusal by politicians. Thus there must be both a demand for the kind of land offered, acceptance of the obligations by the farmer and sufficient discipline in the community to deal with recalcitrant farmers.

Where demand for land is weak but discipline good, it is possible to operate the system if a payment is made to the farmer for each section of land successfully established. This may

well be worthwhile where other systems of regeneration would cost much more and give poorer results.

In Burma, where taungya originated, it was used mainly as a means of regenerating both the soil and the forest under shifting cultivation. It was an improved system because selected tree species such as *Casuarineas equisetifolia* and *Leucaena glauca* were sometimes planted to assist in re-establishing the forest fallow (Nao, 1978). Low population density and a long fallow period were required for the system to be successfully practiced (Nao1978).

At the time when the present forest estates of many tropical countries were constituted, land was abundant, forests dominated the landscape, and shifting cultivation was successfully practiced. Agricultural expansion, introduction of permanent cash crops, and over-cultivation of available arable land have resulted in rapid soil deterioration and lower crop productivity in the unreserved land areas. The reserved forestlands have remained fertile, thus constituting highly potential productive farmland. Such imbalance in soil fertility between reserved and unreserved areas may facilitate successful development of taungya. King (1968) reported that, despite the existence of unoccupied and uncultivated land outside reserves in Uganda, farmers still participated in taungya because of higher fertility of the reserved land. Similarly, Lowe (1974) stressed that one of the major reasons that farmers participated in taungya in Nigeria was the opportunity to use the residual fertility of newly cleared land.

With population growth, an increasing number of farmers have found it difficult to acquire more land for farming. Immigrant labour required for the various forest operations may not get land outside the reserve to grow food to meet their own consumption requirements and that of their families. The introduction of taungya therefore had been a big relief to such farmers. Thus, in some parts of the southwest Nigeria, Ijalana (1997) found immigrant

fishermen (Iajes) constituting about 90 per cent of taungya farmers because they could not get land outside the reserves.

In general, where arable land is too scarce to permit agriculture or forestry as single land use, taungya will develop. According to Lowe (1974) for more than 54 years, the adoption of taungya constituted an effective means of providing more farmland to the farmer and, at the same time, transforming the natural forest into more productive forest plantations at relatively low direct cost to government of Nigeria.

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2.3.2 Taungya System in Ghana

Taungya system was introduced in the country in the early 1920's with the primary aim of obtaining a mature crop of plantation timber in a relatively short time. The technique was started in Ghana when it was realized that some communities bordering forest reserves were experiencing land scarcity for their farming ventures whereas portions of such reserves were poorly stocked in terms of commercial timber species. Under such circumstances the farmers would apply to be allocated portions of such reserves for taungya purposes and following verification from field staff the areas would be allocated to the farmers. Farmers would then cultivate their food crops, interplanting them with the prescribe plantation species. Crops such as plantain, cocoyam, vegetables, and other annuals were normally cultivated for three years after which overcast shade from the tress prevent any further reasonable cultivation of the crops. Farmers were therefore made to discontinue the cultivation of any fresh crops on the allocated plot but then allowed to harvest from the previously planted crops for about two years. Crops yield would be insignificant after 5 years due to shade and canopy cover farmers were expected to quit the plots permanently.

2.4. BENEFITS OF THE TAUNGYA SYSTEM

2.4.1 Employment

According to Sergestrom (1976), plantation forestry provides considerably more employment than management of natural forest. For a clear felling Sergestrom (1976) quotes an average of 60 man-days per hectare. Table 2 details of labour requirements for establishing various types of plantation.

Table 2.1. Labour requirement for establishment of plantations

Operation	Labour requirement per hectare
Initial establishment	
Afforestation of grassland	70 man-days
Planting of moist forest site	100 man-days
Planting of steep terrain	400 man-days
Taungya /Shamba	About 300 family-days (900 man-days)

Source: Evans (1992)

Table 2.2. Labour requirements for maintenance of established plantations

Savannah/grassland plantation	9 man-days
Plantation on rain-forest site	11 man-days
Plantation on steep terrain	13 man-days
Taungya/Shamba	
a) Establishment of the forest crop and cultivation of food	2-2.5 family ⁻¹ a ⁻¹
b) Tending and harvesting the forest crop	11 man-days

Source: Evans (1992)

For taungya systems to be successful, however, it is necessary to have a regular supply of labour. A high proportion of the labour force of tropical agriculture was unemployed or under-employed. The taungya system provided a unique and attractive opportunity for absorption of unemployed rural labour. In particular, it represented the only alternative available to landless rural farmers. Ironically, however, many unemployed farmers were reluctant to participate in taungya system. First, the majority of young potential farmers in rural areas found rural life dull and uninteresting. They were migrating to urban centers, where life was less arduous and monotonous, in search of jobs. Rural-urban migration on a large scale has been encouraged by the worsening rural-urban terms of trade (FAO, 1980). Thus, the majority of farmers participating in taungya in the tropics are people aged 40 years and over (Enabor *et al*, 1982). Some unemployed farmers were willing but unable to participate in taungya because they lacked the necessary inputs to cultivate the land allocated to them in forest reserves. To retain the youth in the rural areas Enabor *et al*, (1982) suggested that more attractive living conditions should be created. To some extent, the establishment of departmental taungya schemes based on integrated forest villages provided with all the basic social amenities enhanced participation of younger farmers in taungya systems (Enabor *et al*, 1982).

2.4.2 Food Production

Taungya system embraces multiple land-use practices involving joint production of forestry and agricultural crops. In the tropics, land is a most important factor of production and there is overwhelming dependence of the population on land for livelihood. The introduction of taungya has alleviated the problems created by the wasteful use of land under the traditional

agricultural systems; increased food supplies, and significantly contributed to the socio-economic well-being of the rural population (Enabor *et al* 1982).

Per capita food production and consumption has been falling for some years in sub-Saharan Africa, along with life expectancy (www.peopleandplanet.net). The yield gap, the difference between average grain yields in SSA and in the world, is still wide. The region's average grain yields were roughly one-third of the world average (1.1 tons per hectare versus 3.2 tons per hectare) in 2008-10. In 2000-2010, the region's grain yields grew 0.42 percent per year, on average. In a third of the 39 SSA countries, yield trends showed a decline during the period (Stacey *et al* 2012).

In Ghana, crop yields have stagnated, and productivity has declined because of rampant soil erosion (World Bank 2006).

Unless these trends are reversed, the developing countries of the tropics will be confronted with the spectra of chronic food shortages, widespread malnutrition, and mass starvation by the end of the twentieth century. Tropical agriculture is particularly extensive, relying on a system of shifting cultivation or rotational agriculture whereby the farmers cultivate a piece of land for a few years, abandon it to fallow to regain fertility, and move on to cultivate another piece of land. They may cultivate several pieces of land successively before returning to re - cultivate the first piece of land at the end of the cultivation cycle. Ordinarily, shifting cultivation requires a large amount of land per farming family, and its successful practice depends on virtually unlimited land availability or a relatively small farming population (Kio, 1972). The population of the tropics has grown very rapidly in the last two decades, averaging 2.5 per cent a year compared with 1 per cent in the developed countries of the temperate region (UN, 1979). Given their small industrial sectors and their limited capacity to absorb excess labour in agriculture, developing countries have faced continuing

fragmentation of farm units to accommodate requirements of new families. The institutional framework of land use in most tropical countries directly promotes such fragmentation of holdings.

Solutions to the defects of shifting cultivation as a form of extensive agriculture have been provided by the system known as taungya. King (1968) found that taungya system has been practiced for a long time and existed at some time in all the five continents. He also indicated that, despite the difference in terms or labels used, the taungya system always exhibited certain basic attributes and required some preconditions for its adoption. The preconditions, such as land hunger and low standard of living of population, are clearly socio-economic of nature. The fact that the system is virtually extinct in the economically advanced countries supports this assertion.

Usually, peasant farmers involved in taungya are allowed to cultivate some food crops with some control as to how and when to plant the crops, especially in the case of plantains and cassava. The crops commonly raised are yams maize, plantains and cocoyam, usually intermixed with garden eggs, okra, pepper, tomatoes, beans and other vegetables. Food crops production takes place during the period between land clearing and the plantation establishment phase.

The system, though hailed as a successful means of combining food and forest production, is often unattractive to farmers. The main objective of taungya is wood production, not food. It persists in areas with high population pressure, where there is adequate government support (Enabor *et al* 1982). It is expected that the food production under the MTS should be more than what was obtained under the taungya system and there is no data available to compare the two systems hence the study

2.4.3 Taungya System and Income Generation

Plantation development can help farm families to make use of their derelict and degraded lands by putting them under tree plantation. Trees may also be used to improve farm systems and return fallow farmlands into production while producing additional benefits in the form of wood and other products for industry (Abu, 1996).

Although the plantations do not yet provide income, there are important socioeconomic benefits derived from intercropping in all the regions, and fuel-wood production in older plantations created in the savannah zones. In all the cases, there is a concrete creation of community assets representing a potential source of income. Beneficiaries are aware of the potential of income generation from the plantations, and the communities expressed the desire to pursue the planting effort (Gasana, 2002).

Under the taungya system, income generation is left entirely in the hands of the farmer, who may find it difficult to get a ready market for the produce. However, (Enabor *et al* 1982) found that although most of the taungya farmers sold less than half of the total crop volume harvested, farmers in Nigeria obtained between N500 and N3, 000 per year. Also, Lowe (1974) observed that most of the foods produced by taungya farmers are consumed locally, yet farmers may earn between N600 and N800 a year if they concentrate on yam production in Nigeria. If maize and cassava were produced, the estimated income would be N100-N200. Another estimate by Enabor (1979) was that per capita income of taungya farmers in Nigeria is about N72, which is below the N90 estimated for urban centers but well above the N30 estimated for rural area. Numerous studies such as those of Stoney and Bratamihardja (1990), Sunderlin (1992), Kartasubrata *et al* (1995), were conducted to determine the potential of

tumpangsari (Taungya) programs to alleviate the socio-economic problems of the rural forest people. Though the tumpangsari programs offer socio-economic opportunities, studies in Java have rated the progress made in tumpangsari as low and thus falling short of expectations (Stoney and Bratamihardja, 1990; Kartasubraata *et al.*, 1995).

In the early years of the taungya system in Sierra Leone, there was one notable effort to reduce the time between plantation establishment and plantation exploitation through the introduction of an understorey of cocoa. Demonstration and observation plots were established under various light conditions. The plots were successful, and afforestation along these lines was gradually extended as the local administration nurseries produced more planting stock. The cocoa, which replaced part of the natural understorey, yielded quick monetary returns as minor forest produce (Koroma, 1996).

Several estimates of income earned by the farmer under taungya have been made. In Nigeria, the estimates of annual income range from N50 (Ball, 1977) as cited in Enabor *et al* 1982) to N600. In Zambia, the profit net present value) from maize intercropped with pines in an industrial plantation increased 7 percent in one year compared with the pure pine plantation (Enabor *et al* 1982).

According to Fobih (2004), increase in population and expansion of settlements at the fringes of forest reserves and national parks have resulted in farming within forest reserves, as well as illegal felling of trees, and poaching of wildlife. These are serious issues that affect proper management of forest and wildlife resources. The solution to these does not lie in legislation only, but rather on a combination of both legislation and an effective programme of

collaboration and cooperation of the local communities involved. The need to find a mutually beneficial way of integrating the communities into forest management programmes to secure and sustain the livelihoods for the communities so as to ensure that the communities participate in the benefits the reserves bring is now an acceptable strategy for dealing with the problem (Fobih, 2004).

When forest reserves were created in the 1930s, different resource rights were envisaged, aimed at developing a revenue base for chiefs and resources owning communities. These included the rights of farmers who already had farms in the reserve area to continue to farm in designated areas; customary rights of individuals or communities to the forest reserve land (including indigenous cultural or religious rights), if not considered harmful to the forest and right of forest-adjacent communities to access forest resources in the forest reserve for domestic purposes (e.g. medicinal uses, home consumption, poles for construction).

However, despite the intent, there was no legislation to ensure these rights or to ensure an equitable flow of benefits to landowners and local communities or their consultation on decisions influencing resource utilization and management. The Timber Resources Management Amendment Act, 2002, and the Forest Plantation Development Fund Amendment Act 2002, strengthen the ownership rights of farmers and would provide for incentives for the modified taungya system.

Land tenure is enormously complex and the associated problems have long been recognized as some of the most difficult obstacles to development in the tropics. The question of tree

tenure is equally so. Rights to trees, whether planted or not, are not always clear, and confusion or uncertainty over who can cut what and when can be a major disincentive.

Customary laws do not prevent tenants from cultivating trees. However, landowners do not encourage this because the long production period of trees and lack of appropriate documentation proving land ownership increases the tenant's security of tenure when trees are planted. People generally have more secure rights to own planted, then naturally occurring trees. In this regard, tenants are not usually permitted to sell fruits, trees and parts of trees growing naturally on their farm but can harvest them for personal use. They can, however, dispose of planted commercial trees, after consulting the landlord, who normally requests a percentage of the revenue (Agyemang *et al* 2003).

2.5 CHALLENGES OF THE TAUNGYA SYSTEM

Under the traditional taungya arrangements, Ghanaian farmers had no rights to benefits accruing from the planted trees (Milton, 1994) and no decision-making role in any aspect of forest management (Birikorang, 2001). As a result, farmers tended to neglect the tree crops and to abuse the system. For example, farmers deliberately killed planted seedlings to extend their tenure over portions of land, since a successful plantation meant the discontinuation of cultivation on allocated plots; cleared more land for plantation development than needed for the available seedlings; failed to weed around tree seedlings, thereby retarding their growth so as to extend land-use rights beyond three years; illegally farmed other areas in forest reserves, degraded or not, which were not allocated for taungya; Planted food crops that were not compatible with the tree crops, leading to reduced tree growth.

Other problems included lack of supervision by the Forestry Department (now the Forest Services Division of the Forestry Commission), inadequate financing mechanisms and abuse of power by public officials, especially in farm allocation (Agyeman *et al.*, 2003).

The Taungya system (TS) was suspended in 1984 due to a low success rate; for instance 57% of the total TS plantations had survived at the time of evaluation, with only 21 % of the total area considered commercially viable. The poor performance of the TS was due to a number of factors, including lack of direct monetary benefits. For example 75 % of the revenue from the planted trees went to government agencies (Forestry Commission, District Assemblies and Administrator of Stool Lands) and the rest went to land owners (Traditional Authorities). The farmers only benefited from their food crops but did not receive any benefits from the tree crops. Other factors that contributed to the failure of the system included poor forest access, lack of long-term tenure and weak local community rights to ownership, participation and consultation, the inability of the Forestry commission to provide effective supervision, and the lack of an equitable benefit-sharing framework among the key stakeholders.

The system was suspended in 1984. However, in spite of the problems, forest-adjacent communities still viewed the taungya system as potentially one of the most beneficial forest tenure systems, and they requested its reintroduction, albeit with changes (Agyemang *et al* 2003).

In 2001, in an attempt to tackle Ghana's increasing deforestation rates, the government initiated a National Forest Plantation Development Project (NFPDP). The NFPDP had a target of planting 20,000 ha per annum, aimed at restoring forest cover, addressing the wood

deficit situation, creating jobs and alleviating poverty within forest fringe communities, which are among the poorest communities in Ghana. The NFPDP was designed to use mainly the Modified Taungya System (MTS) in which most of the earlier shortcomings of the previous TS have been addressed.

2.6 THE MODIFIED TAUNGYA SYSTEM

The Modified Taungya System (MTS) is a form of agrisilviculture, or farm forestry, whereby food crops are interplanted with tree crops at the time of establishment (or regeneration) of the crop, and in which the forestry agency collaborates with peasant farmers. The farmers are allowed to benefit from the forest products and are considered co-owners of the forest plantations.

2.6.1 Principles and setup of the MTS

The key changes in the MTS are the introduction of legally-binding Land Lease and Benefit Sharing agreements. These agreements were designed with the participation of the Attorney General's Department, private legal practitioners and non-governmental organizations, with support from the FAO, the African Development Bank and the UK's Department for International Development.

Under these agreements, farmers will be co-owners of the plantations with the Forestry Commission and will stay on the land till the tree crops mature, instead of being driven off after three years, as was practiced under the TS. Farmers are guaranteed a 40 percent share in the plantations and 100 percent of the agricultural crop proceeds. The remaining benefits from the tree plantations will be split between the government (40 %), the landowners (15 %)

and the forest fringe communities (5 %). Thus, the MTS is essentially a business enterprise with all participants (Forestry Commission, landowners, farmers and local communities) providing land, labour and capital and sharing the production, market responsibilities and risks – with net benefits shared proportionally according to the level of inputs.

When these agreements were introduced, the Forestry Commission was inundated with requests from farmers to participate in the Modified Taungya System. Over 53,000 ha of plantations were established using the MTS alone between 2001 and 2005 nationwide.

Others essential features of the “Modified Taungya System” are as follows:

Farmers will essentially be owners of the products with the Forestry Commission, landowners and forest fringe communities as shareholders. The right of farmers are guaranteed under the Timber Resources Management Amendment Act, 2002 (Act 617), section 4, subsection 3 which states that “no timber rights shall be granted in respect of land with private plantation; or land with any timber grown or owned by any individual or group of individuals.” Therefore timber grown by farmers even within reserves shall belong to them and not be subjected to any timber rights by the Forestry Commission. However, under the previous Taungya System, the Forestry Commission was the owner with landowners as the only beneficiaries. Farmers benefited from their food crops but did not receive any benefits from the tree crops.

Farmers will carry out most of the functions, including pruning, maintenance and tending, while the Forestry Commission (FC) will be responsible for training the farmers to carry out the functions efficiently. The FC will also be responsible for supply of equipment and tools, stock inventory and auctioning or marketing of products. Thus this benefit sharing was

expected to make the farmers tend the seedlings and stay on their portion after they harvest their food crop to help manage the plantation making the MTS more reliable means of afforestation.

2.7. OPERATIONS OF THE MODIFIED TAUNGYA SYSTEM

2.7.1 Project Document on the Modified Taungya System

The Modified Taungya System (MTS) is based on the original Taungya system, which was revised to include self-financing and sustainability issues during a consultation process from July 2001 to December 2002. The process was initiated by the Government of Ghana with support from FAO and the World Bank. Consultations involved stakeholder groups, including farmers, landowners, local communities and NGOs.

Under the MTS, farmers are the owners of forest plantation products, and the Forestry Commission, landowners and forest-adjacent communities are shareholders. (Marfo 2009). According to Marfo (2009) originally the taungya system was introduced in the 1920s to Ghana with the idea of growing both timber trees and agricultural products on the same piece of land with the aim to address both the lack of farmland in Ghana's forest reserves and in order to grow commercial timber quickly. However the farmers were not included and did not receive any revenue from the timber. The scheme failed due to lot of reasons including: farmers not having any share from timber revenue, inequitable distribution of benefits accrued, abuse of power by officials, lack of supervision, and conflict of interests between growth of trees and crop production (Agyemang *et al.* 2003). The MTS reflects shifts in forest management thinking and is a clear example of Collaborative Forest Management (CFM).

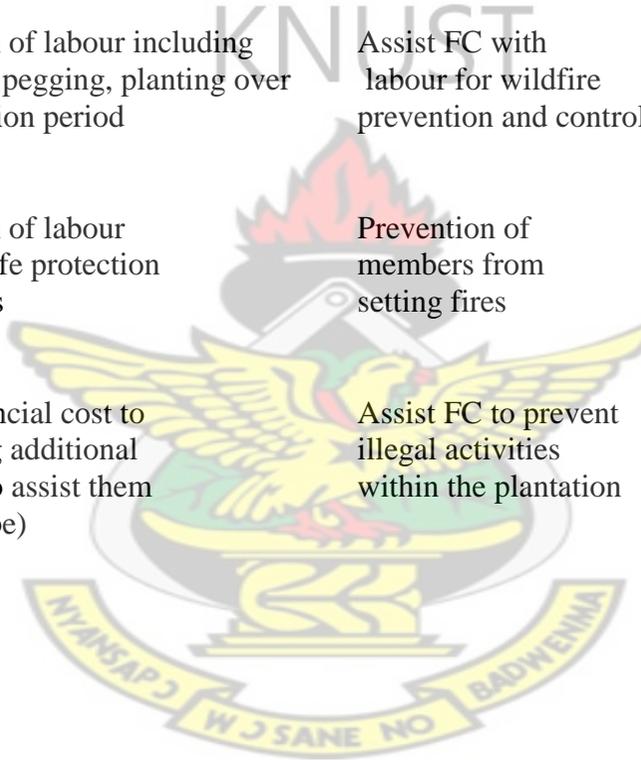
One crucial evolution in the Modified Taungya System is the improvement in tenure security and benefit arrangements: farmers are now essentially the co-owners of forest plantation products, with the Forestry Commission, landowners and forest-adjacent communities acting as shareholders. The ownership of the trees has been transformed from a single entity (the government) to multiple owners (farmers, local communities, government and landowners). All participants in the MTS, including the farmers, are eligible for a share of the benefits accruing from the plantation (Agyemang *et al.* 2003).

A consultation process devised an equitable benefit-sharing framework based on the contributions of the participant. The arrangement is legally binding and upon sale of the timber (after between 10-20 years depending on tree species and location) the benefits are to be shared as discussed above.

The consultation process also recommended specific policy and legislative reforms to strengthen tenure and resources use rights and to secure greater participation for disadvantaged groups (land-poor and land-insecure households, tenant farmers, women migrants, farm labourers and nursery operators). These recommended policies, which were expected to lead to increased revenue and other benefits to farmers and landowning communities in line with the objectives of the 2001 Ghana Poverty Reduction Strategy were approved by the then ruling government.

Table 2.3 Division of responsibilities under the MTS (Source: Marfo, 2009).

<u>Forestry Commission</u>	<u>Farmers</u>	<u>Community</u>	<u>Traditional Authority</u>
Supply good quality seedlings To farmer groups	Provision of labour including weeding, pegging, planting over The rotation period	Assist FC with labour for wildfire prevention and control	Provide land within the degraded forest
Provision of training and extension services	Provision of labour for wildlife protection Strategies	Prevention of members from setting fires	Guarantee uninterrupted access to the allocated land for the FC and other parties
Marketing and accounting of the plantation products	bear financial cost to recruiting additional Labour to assist them (If need be)	Assist FC to prevent illegal activities within the plantation	
Manage, oversees and see To day-to-day supervision of activities			
Provide financial resources and equipment to fulfill its own obligations			



2.7.2 Land tenure and resource use rights

At the beginning of the twentieth century, the forest area of Ghana covered about 34 percent of the total land area. Forest reservation was started in 1927 by the colonial administration and ensured the reservation of 11 percent of the country's total land area. In all, 282 forest reserves and 15 wildlife protected areas, occupying more than 38 000 km² or about 16 percent of the total land area, were established and gazette in Ghana. There was an additional 4 000 km² of forest outside this gazette area. The main aim of the reservation programme was to ensure the protection of substantial areas of forest, but the process of forest land reservation ignored the traditional tenure system, which led to a negative attitude to reserves among the population, especially in forest fringe communities. This situation was aggravated by a failure to inform forest communities of their usufruct rights and by the focusing of forest management on forest protection by the central government.

When forest reserves were created in the 1930s, different resource rights were envisaged, aimed at developing a revenue base for chiefs and resource-owning communities. These included the rights of farmers who already had farms in the reserve area to continue to farm in designated areas; customary rights of individuals or communities to the forest reserve land (including indigenous cultural or religious rights), if not considered harmful to the forest; and the right of forest-adjacent communities to access forest resources in the forest reserve for domestic purposes (e.g. medicinal uses, home consumption, poles for construction) (Agyemang *et al* 2003).

However, despite the intent, there was no legislation to ensure these rights or to ensure an equitable flow of benefits to landowners and local communities or their consultation on decisions influencing resource utilization and management. The Timber Resources Management Amendment Act, 2002, and the Forest Plantations Development Fund

Amendment Act, 2002, strengthen the ownership rights of farmers and would provide for incentives for the modified taungya system (Agyemang *et al* 2003).

The timber Resources Management Amendment Act, 2002 (Act 617) section 2 (a) which states that:

- ✓ No timber rights shall be granted in respect of-
 - a. Land with farms without written authorization of the individual, group or owners concerned

Section 3 (a) and (b)

- ✓ No timber right shall be granted in respect of –
 - a. Land with private forest plantation or
 - b. Land with any timber grown or owned by any individual or group of people

The complex land tenure system and the weak governance arrangements in many parts of Africa can hinder the potential of MTS to contribute to poverty reduction in local communities. The challenge is to ensure that the financial benefits flowing from the implementation of the MTS are equitably distributed among all stakeholders, especially local communities. This is crucial because there is enormous evidence across the world to show that forest exploitation and use has not substantially benefited local people. In Ghana, tree and forest tenure security is shaped by another set of rights overlaying this already very complex situation of land tenure. Several conditions complicate tree and forest tenure security and this has largely compromised access and distribution of forest benefits. While the legislative framework of Ghana (Act 547) offers tenure security for planted trees and forests (plantations), tenure rights over natural forest resources remain problematic both in law and in practice

According to Agyemang *et al* (2003), Land tenure arrangements need to provide sufficient security for sustainable tree plantation investments. Farmers need to feel confident that their rights will not be taken away in the medium and long term. According to Marfo *et al* (2012) lack of secure community tenure rights and the dominance of unaccountable authority-which leads to benefit capture by local elites-are critical constraints to equitable forest benefit sharing and unless these issues are addressed in policy and practice, the potential economic benefits from the MTS may not benefit local people; they may even reinforce the gap between the rich and the poor.

2.7.3 Equitable Benefit-Sharing Framework

In order that taungya plantation development schemes become successful the social and economic needs of the farmers must be incorporated into the taungya forest plantation development schemes. If it is based purely on technical grounds and national economic criteria the scheme is most likely to be unsuccessful. Over the past decade, policymakers and governments have realized that it is impossible for the state alone to adequately manage and police vast public forest lands because of budgetary constraints, inadequate institutional capacity and lack of incentives to regulate the large and growing number of forest users (Banarjee *et al.*, 1997). This has compelled governments of developing countries to shift forest policy trend towards adoption of participatory management and benefit sharing with communities living within proximity of forests (Behera and Engel 2005). With this conceptual and ideological paradigm shift, local communities are recognized as the key focus for success of conservation efforts (Behera and Engel, 2005). Sustainable management of forest reserve is linked to participation of forest-dependent communities in the management and the utilization of benefits to improve livelihoods (Ghana Forestry Commission, 2009).

With regard to forest benefit negotiation and distribution, chiefs continue to wield substantial influence (Marfo 2001); this is a significant constraint to the flow of benefits and must be corrected. The issue of benefit capture has been an important problem across developing countries (TBI 2005; Ribot 1999). In Ghana, benefit sharing is one of the major issues in policy discourse, and conflicts related to benefit sharing are pervasive (Marfo 2006). Marfo (2012) stated that at a national forest sector prioritization workshop, the issue of benefit sharing was ranked among the top five problems (Forestry Commission).

To a large extent, there has been a systematic finding that forest benefits meant for communities in Ghana are often captured by local authorities, both traditional and government (Marfo 2009). He continued to state that, in the workshop mentioned above, it was strongly noted that farmers need to be considered as a separate community-based stakeholder group because of the unique role they play in off-reserve tree management (TBI 2005) and because benefits fail to reach them. The main forest benefits directed to communities have been royalties paid from stumpage fees, land rent collected from commercial loggers, and social responsibility agreements negotiated directly with communities.

Ministry of Environment and Science MSE (2002), indicates that Ghana's permanent forest estate is estimated to be 10.9 -11.8 % of the original forest cover. Currently, Ghana has an average annual deforestation rate of 22,000 ha/annum and less than 1 % of forest cover in off-forest reserves. This decline has been attributed mostly to failure of forest policies to explicitly deal with the low involvement of local stakeholders, lack of access and unequal

benefit sharing of timber and non-timber resources in both on-reserve and off-reserve areas of Ghana (Marfo, 2009).

Analysis of the estimated value of stakeholder contributions to plantation investment was used to propose the following benefit-sharing framework (Fig. 1), adjusted according to stakeholder expectations regarding the benefits they would receive: farmers and the Forestry Commission should receive 40% each of benefits accruing based on their inputs, while landowners should receive 15% (i.e. traditional authorities 7% and tribal landowners 8%) and forest-adjacent communities should receive 5% (Fig. 2), (Agyemang *et al.* 2003).



Table 2.4. Comparison of benefit sharing frameworks under the old taungya system and modified taungya system (percentage share of benefits)

Stakeholder	Old Taungya System	Modified Taungya System
Public agencies		
Forestry Commission	60	40
District Assembly	20	0
Administrator of stool land	4	0
Subtotal	84	40
Local Community groups		
Tribe Landowners	9	8
Traditional authority	7	7
Forest Adjacent community	0	5
Farmers	0	40
Subtotal	16	60
Total	100	100

Source: Agyemang *et al*, 2003

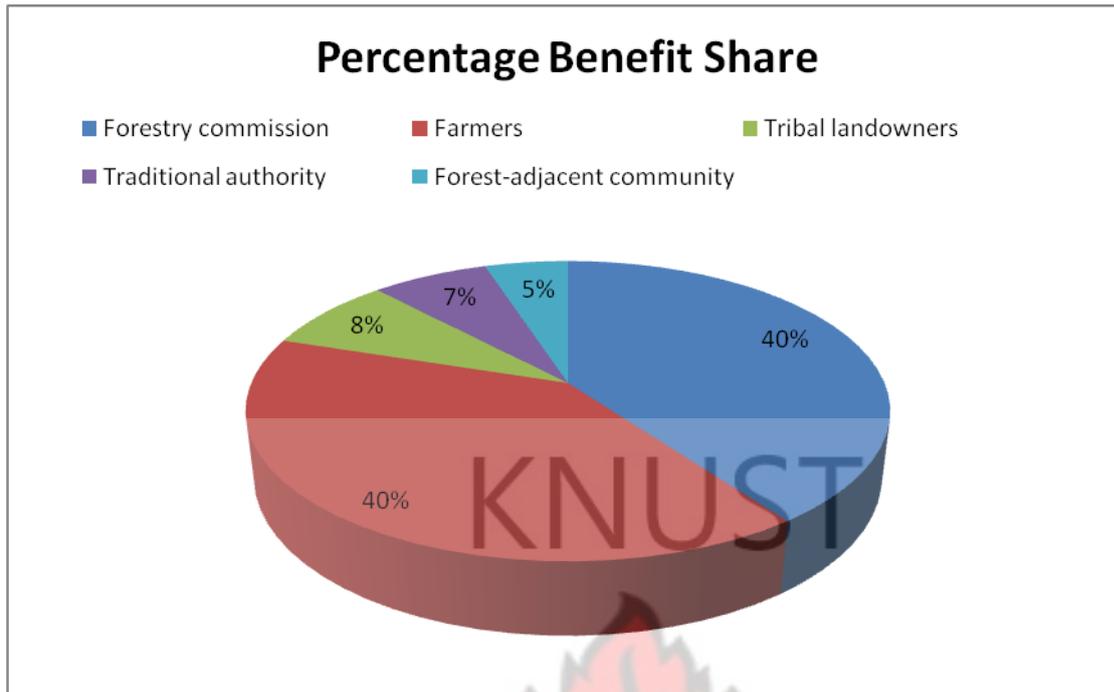


Figure 2.2. Proportion (%) of benefits from MTS shared among Stakeholders

2.7.4 Estimated Financial Benefits of the Modified Taungya System

A financial analysis was carried out based on projections of two investment scenarios, the modified taungya system and smallholder forest plantation development without food crops. The analysis was based on actual costs and revenue and covered a project cycle of 25 years, which is the maturity period of *Tectona grandis*, the most commonly planted tree species. The analysis showed an estimated internal rate of return (IRR) of 16.2 % for the modified taungya system and 13.6% for smallholder forest plantation development (Agyemang *et al*, 2003).

2.7.5 Institutional Arrangements

The implementation of the MTS involves a number of institutions as such an elaborate institutional framework has been proposed by all stakeholders, intended to ensure, among

other things: equity and transparency in land allocation to farmers; implementation of appropriate procedures for developing and documenting land lease and benefit-sharing agreements; clear and reliable systems for addressing grievance of stakeholders (and farmers in particular).

According to Agyemang *et al* (2003), the highlight of the institutional arrangements is the establishment of Land Allocation and Taungya Management Committees at the community level. The membership of this committee headed by the forestry commission is predominantly farmers, who are involved in the development of forest plantations within degraded forests. These committees would be responsible for allocation of degraded land to farmers, monitoring farmers and Forestry Commission performance, instituting sanctions and settling and settling disputes. The committees would also be responsible for ensuring the compliance of all parties within the contract agreement.

The Forestry Commission is expected to keep a detailed register of participants. Copies of benefit-sharing agreements, which may be in the form of bonds, should be lodged with the Attorney-General's Department and other relevant institutions. At present, the Forestry Commission's capacity to compile and store these elaborate records is doubtful. However, the Government of Ghana, with the support of the World Bank, the United Kingdom's Department for International Development (DFID) and the African Development Bank, is working to strengthen capacity in all districts, including the supply of equipment and staff responsible for dealing with communities; these ongoing efforts provide some basis for optimism, (Agyemang *et al* 2003).

2.7.6 Ensuring Participation and Conflict Management

The Taungya System was suspended due to abuse by public officials in the area of land allocation, according to Agyemang *et al* (2003). The formation of Land Allocation and Taungya Management Committees at the local community level is to enable all stakeholders to consult each other and coordinate their efforts to address the major issues and impediments to implementation of the system. It will be a challenge, however, to accommodate the diverse, sometimes conflicting interests of the numerous stakeholders so as to engage and sustain their good will, their commitment and in some cases their active participation.

2.8. THE EFFECT OF THE MODIFY TAUNGYA SYSTEM (MTS) ON THE SOCIAL, ECONOMIC, AND ENVIRONMENTAL PROBLEMS

Prior to the introduction of the MTS, there were a lot of socio-economic environmental challenges confronting many communities among these were poverty, unemployment and deforestation. The MTS introduction was aimed at reducing these challenges facing the forest fringe communities.

2.8.1 Socio Economic Impact of Modified Taungya System

The Basic Needs strategy is one of the major strategies to the measurement of absolute poverty. It defines the minimum resources necessary for long-term physical well-being. The Basic Needs strategy seeks to relieve as quickly as possible absolute poverty through direct assistance in terms of food consumption, education, human rights, employment and political involvement (Webster, 1990). According to Webster (1990), the Basic Needs strategy addresses land reforms through land redistribution and by making cheap loans or grants available to rural households.

According to Sunderlin, *et al* (2003), the relationship between natural resources and the livelihoods of rural people who depend on them, in large part, is determined and heavily dependent on the quality of the natural resource base (*i.e.* the content and condition of the landscape) on which they are dependent.

A lot of research and literature has been done to correlate the relationship between poverty and disappearance of forest and there has been increased interest to understand the contribution that forest resources can make to the provision of local employment, income and the well-being of rural communities (Arnold and Townson 1998). This relationship can be described as forest based poverty alleviation (FBPA) (Sunderlin *et al.* 2005), and is understood as the use of forest resources for the purpose of lessening deprivation of well-being on either a temporary or more permanent basis.

Opoku (2006), reports that 60% of Ghana's population (total population being approximately 21 million) live in forest-dependent communities and the people in forest-fringe communities are in an 'alarming' social condition. The management of forests and trees can be crucial to improving the wellbeing of people in forest-fringe communities, where there are few opportunities and assets for improving livelihoods aside from the forest and the reforestation schemes under the new governance arrangements.

Opoku (2006), reports of the "alarming situation" of forest-fringe communities, where massive destruction of forest has brought about social, economic and human rights' decay. Widespread poverty has been identified as a consequence of forest degradation.

Thus the 1994 Forest and Wild life Policy seek to arrest some of the short falls in forest management which resulted forest degradation and the introduction of the MTS also is to increase the forest cover and improve the livelihood of the forest fringe communities. For

example Affum Baffoe and Boakye (2006) stated that one of the main livelihood interventions to have resulted from the 1994 Forest and Wildlife Policy was the introduction of collaborative boundary maintenance. Under this scheme, FSD contracted rural forest fringe communities to clean the forest boundaries for a fee. It was expected that the rising incidence of illegal encroachment would be reduced by providing direct financial benefits to participating contract cleaners, but although successful in some areas the scheme had problems related to long delays in payment and has had to be suspended.

The Forestry Commission is pursuing other management interventions and projects for livelihood sustenance with community involvement. Some of these involve creating alternative livelihoods through beekeeping, snail rearing, and grass-cutter rearing and micro-credit funds for the improvement of subsistence farming activities. The pressure of population increase in forest fringe communities – through both legal and illegal entry – is expected to diminish, ensuring a positive trend in the sustainable management of forests and helping to alleviate poverty. Projects such as the High Forest Biodiversity Conservation Areas (HFBCA) Project have gone further in this direction by creating community investment funds to ensure continuous development and improvement of the livelihoods of forest fringe communities.

This project has received US\$2.5 million, and seeks the collaboration of forest fringe communities through community-based advisory groups for the management, protection and conservation of Ghana's forest reserves. (Affum Baffoe and Boakye 2006)

Other livelihood options identified in forest reserve management plans include ecotourism with community participation to ensure ownership, the free flow of benefits to communities,

and employment creation for people involved in implementing activities. This concept could be extended to the seven national parks, six resource reserves, four wildlife sanctuaries, five coastal Ramsar sites and the nature reserve.

The Modified Taungya System, which is currently being used in national reforestation projects in forest reserves, provides the population with some economic benefits and livelihood sources. More than 36 000 jobs created annually for the minimum achieved planting target of 10 000 ha. Forest fringe community members have stopped migrating to urban centers in search of work. 120 000 tonnes of food produced annually from a minimum achieved planting target of 10 000 ha: maize, 19 000 tonnes in 2005; and plantain 740 000 tonnes from 2002 to 2005. Improved economic well-being of plantation farmers through payments for clearing, peg-cutting, planting, maintenance, etc. (Affum Baffoe and Boakyie 2006).

Sunderlin *et al.* (2003) outline development which may impact and improve the potential of forests to alleviate poverty: decentralization; forest tenure change; democratization; anti-corruption campaigns; retreat of concessionaries; growing markets; market deregulation and liberalization, new technologies and growing global environmental threats. Agyemang *et al.* (2003) discussed the general notion of the need to increase access to forest resources, provide security of tenure and optimize revenue generation. They also discussed the manner in which poverty can be reduced at a rural level through the judicious use of forest resources, along with the equitable distribution of wealth, which fits in line with the intentions of the MTS.

According to Agyemang *et al.* (2003), in Ghana in order to alleviate poverty at the rural level it is generally proposed that there is the need to increase access to forest resources, provide

security of tenure and optimize revenue and income generation at the rural level to create wealth. Thus access to required assets generates livelihood outcomes in the form of more or adequate income, increased well-being, reduced vulnerability, improved food security, more sustainable use of natural resource base which enhances people's living conditions or enable them escape poverty (DFID, 1999).

One of the collaborative approaches to enhance farmers' participation and ownership of forest resources is the MTS. Farmers are given rights to access the land, rights to own food legally bound to own a proportion (40%) of the final income from the sale of the timber.

Evans (1992) stated that plantation forestry in the tropics can significantly aid economic development. Although the roles of plantation forestry have been abused, industrial plantation establishments as well as tree planting for social and environmental objectives remain central to the bulk of industry strategies of tropical countries developed under the Tropical Forestry Action Plan. Plantation development can help farm families to make use of their derelict and degraded lands by putting them under tree plantation. Trees may be used to improve farm system and return fallow farmland into production while producing additional benefits in the form of wood and other product for industry (Hawthorn and Abu, 1995).

According Black *et al* (2001), plantation development may create the potential to a later date for further development e.g. integrated wood yards, log mills, veneer plants, chippers and wood fired power plants. Such development would create additional jobs to those involved in growing and harvesting trees. Forestation has become an important part of the national development in many countries of the world. By the late 1970s about 9m ha of man-made forest were established annually (Wiersum 1984). However, these huge areas of planted forests still did not compensate for the loss of the forested land throughout the world or for

the degradation of the remaining forest, especially in the tropical regions (Shepherd, 1986). But According to Jennier (2009), despite the introduction of various reforestation schemes in Ghana, forest and tree resources do not adequately serve as reliable sources of livelihoods for forest-fringe communities. It can be argued that the Ghanaian forestry governance context (policies, laws, institutions) seems to hinder the potential of forest and tree schemes as reliable forest and tree-related livelihoods.

2.8.2 Food production

According to FAO, (2003), Forestry contributes to about 11%, whilst agriculture contributes 38% to the Gross Domestic Products (GDP) of Ghana. Ghana has a deforestation rate of 112.54 km² per annum and is attributed to poor agricultural practices as in slash and burn system that which leads to large forest clearance for farming (FAO, 2003). The country's economy is agro-based and agriculture provides employment for about 70% of the populace. According to Assabil, (1996) there is competition for land between the forestry and the agricultural sectors as seen in many areas where large areas of forest lands are cleared annually for agriculture.

The Forestry Commission's approach to mitigating deforestation whilst making some lands available for agriculture has been reforestation employing the "Modified Taungya System". In this approach short rotational tree crops such as *Tectona grandis* (Teak), *Gmelina arborea* (Gmelina) and *Cedrella odorata* (Cedrella) are mostly used (Owusu, 2002).

One of the objectives of the Modified Taungya System is to significantly increase food production in the country thereby contributing to wealth creation and reduction in rural poverty. The MTS is expected to produce 30,000 tonnes of foodstuff annually. The contribution made by the project towards increased food production in the country and job

opportunities for the rural communities over the years were quite remarkable (Agyemang *et al.* 2003).

It is expected that the income generated from the MTS will be higher than that Income Generation generated in the taungya system but there is no literature/ empirical work done to ascertain the amount each farmer will get by participating in the MTS hence this study.

2.8.3 Environmental Impacts

Reforestation of the degraded land offers indirect benefits that could include: improvement of soil fertility, control of water and soil erosion, regulation of water quality, and prevention of desertification (Kalame, 2009). Planted forests are neither inherently good nor bad; rather it is the choices we make about how to use them that determine whether they contribute to, or detract from, broader societal goals such as poverty reduction and nature conservation (IUCN/WWF 2006). Planted forests can be used to provide other environmental benefits such as water quality improvement, dry land salinity mitigation, carbon sequestration, and habitat for native plants and animals.

Plantations are also considered by some to be a potential driver of regional development and of the rejuvenation of rural communities. However, the appropriate nature, design and operation of plantations to provide multiple benefits are not necessarily well understood, and the extent to which plantations might meet environmental expectations remains unclear (Gerrand *et al* 2006).

Increasing interest in forest plantations as a source of wood and industrial fibre has been accompanied by increased concerns about the potential environmental impacts of establishing forest plantations on a large scale. The concerns focus on the potential loss of soil fertility

and productivity under short harvest rotations, risks associated with introducing exotics, risks of catastrophic disease and insect infestations through cultivation of monocultures, and the implications of replacing natural forests and associated flora and fauna with less biologically diverse plantations. On the other hand, one of the most compelling reasons for establishing forest plantations is that wood consumption is rising at the same time as increasing efforts are underway to reduce harvesting in natural forests.

Highly productive forest plantations are seen as a part of the solution to this growing dilemma. Such plantations can provide large quantities of wood and fibre from relatively small land areas, supplying a continuous, renewable stream of industrial raw materials that result in less overall environmental impact than other types of raw materials while also reducing pressures for harvesting in natural forests.

Despite the recognized benefits of forest plantations, there are also several widely-shared concerns about the possibility of massive plantation development. These concerns include:

Loss of soil productivity – Reduced yields under intensive management of short rotation tree crops have long been a concern of foresters. Recent literature suggests that this remains a major concern with numerous references to soil compaction, erosion, and degradation of physical and nutritional properties of soil. It has been observed, for example, that plantations tend to be kept in an early Succession stage, with maximum removal of biomass from the site at harvest. Plantations are also said to be less efficient at trapping released nutrients, due in part to the existence of fewer roots near the surface. The result may be significant nutrient loss from sites where trees are harvested. The beneficial effects of trees in relation to soil fertility rejuvenation, productivity and nutrient cycling, and microclimate can be positively exploited, especially in the context of developing systems for both marginal and prime agricultural lands (Gordon and Newman, 1997). The success of intercropping hinges on the

ability of the system components to maximize resource utilization while maintaining „complementary“ interactions between them (Rao *et al* 1997). When this occurs, productivity per unit area is often enhanced resulting in higher economic returns. When components of an intercropping system vary dramatically (e.g., woody and non-woody plants), the demand for limited resources is generally staggered in space and time, and resource capture and productivity per unit land area may be maximized (Thevathasan and Gordon, 1997). On a biological level, intercropping increases micro- and macro- faunal diversity, both above and below ground. The increased range of faunal activity gives clear indication of ecosystem „health“ within an intercropping system relative to that associated with conventional agricultural practices. From an ecological perspective, intercropping systems trap larger amounts of energy at different trophic levels, demonstrating higher energy utilization efficiency (Thevathasan and Gordon, 1997). In relation to CO₂ sequestration and other greenhouse gases (e.g. N₂O) emission reductions, tree-based intercropping systems have the potential to greatly contribute to climate change mitigation (Gordon and Newman, 1998).

- Disruption of local water cycles – Concerns about the impact of plantations on soil moisture and water yield are mostly related to soil moisture depletion and reduced stream flow. Plantation establishment on grassland, for example, sometimes diminishes stream flow after canopy closure, particularly during dry seasons. Research suggests that the reason for reduced stream flow is not generally a differential rate in transpiration, but primarily the interception and re-evaporation of rainfall at the crown level. Interception has been found to amount to as much as 30 percent of the rainfall, over a fairly wide range of rainfall amounts. Another concern is that certain species – mainly eucalypts which account for as much as 25 percent of

the plantation area worldwide – may use far more water than species that occur in natural forests, drawing down the water table in some localities.

According to FAO (1993), plantations are being established at an increasing rate in some degraded forest areas but many of these utilize exotic species. The result is that, productivity is restored to some of these degraded forest areas but the levels of regional biodiversity are declining even further. The future for tropical forest land seems to hold the prospects of a landscape of degraded forest, monoculture on steeper lands or in one remote area. All this is what the most biologically diverse region on earth was once. Planting trees will usually induce changes in the local biological and physical environment. Potential planting sites can have attributes that have archaeological, cultural or spiritual significance at the local, national and global levels that may be adversely affected by forestation activities by destroying them, (Black *et al*, 2001).

Very little is known about the risk to exotics from pests and diseases. It would appear that the risk from root rot is greatest in the first five years of a plantation, in which the debris and stumps of the original forest provide food for the multiplication of root fungi such as *Fomes lignosus*. Both teak and *Gmelina* plantations have suffered about 2 percent of deaths in Nigeria. This usually occurs in small groups. In Trinidad, Pawsey (1966) suggests that the risk in pine plantations grown on felled hardwood forest sites is not serious and will probably decrease as they get older. It is important, however, to watch for pathogens and test out a number of species in case one is devastated by a pest or disease. The known pests of the Meliaceae can be rendered ineffective by good silviculture. (Lamb 1967).

2.9 FARMING IMPLEMENTS/INCENTIVE GIVEN TO THE FARMERS

According to Nadjombe (1981), in Togo, the FAO with Forest Development and Exploitation Authority (ODEF) a government organization set up in 1971 to stimulate reforestation activities-reintroduced the taungya on its sites in 1972, adding new elements such as incentives in the form of bonuses in cash and in kind. The cash bonus was fixed at 6,000 Fr CFA (in 1981, 400 Fr CFA = US\$1) and there were supplies worth 23,000 Fr CFA for the first year of the contract. These incentives made it possible to plant more than 1,200 ha of *Terminalia superba*. According to Agyemang *et al* (2003), Government inputs will be provision of technical support, financial resources and equipment, which will be approximately 40% of production costs or €200,000 (US\$27) per farmer per hectare per year.

2.10 ALLOCATION OF FARMLANDS TO FARMERS

There is land allocation and Taungya Management Committees at the community level, head by the Forestry Commission but predominantly comprising farmers, for the development of forest plantations within degraded forests. These committees are responsible for allocation of degraded lands to farmers (Agyemang 2001).

Despite the increasing rehabilitation initiatives involving local communities only few of such initiatives can boast of being highly successful (Appiah, 2001). This is due to lack of local people's commitment which is as a result of poor partnership approaches, absent of or poorly utilized incentives (Brown, 2003) or a mismatch about the perception of priority needs or benefits between project initiators and the local communities or a combination of these (Brown, 2002).

2.11 SUSTAINABLE LIVELIHOOD APPROACH

The Sustainable Livelihoods Approach (SLA) (Fig.4) is an approach, made in order to understand how poor people in rural areas build their livelihoods, which goes beyond a purely economic approach to poverty. It recognises the multifaceted dimension to poverty and offers a framework which explains the way people express their agency, the assets they draw upon the strategies they devise, and the activities they take part in (Jennie 2009).

According to Krantz (2001), SLA recognises that the poor know best what their needs are and should thus be involved in processes that can contribute to policies being made. The framework emphasizes the contribution that external factors make, and the dynamic nature of reality, given that every capital influences the others and people can make use of a particular asset by reducing or increasing the contribution of another one (Bebbington 1999; Rakodi 2002). According to Carney (1998) livelihood is defined as “the capabilities, assets (including both material and social resources) and activities required for a means of living”.

The assets are defined as capitals (natural, human, financial, physical and social) and more than just being simply the means to make a living with, they also give value to people’s life. This definition incorporates attributes such as: getting the basic requirement of living (food, shelter, clothing, money); capabilities or capacities, which are based on equity, ownership of resources and participatory decision making (Hiremath and Raju 2004); assets, namely: natural, human, financial, physical and social capitals; and maintaining or enhancing capabilities and assets. According to Jennie (2009), the potential of sustainable forest and tree-related livelihood activity is grounded in the concept of SLA. However as Shackleton *et al.* (2008) pointed out, these capacities are reliant upon the availability and accessibility of options which are ecological, socio-cultural, economic, and political and are predicated on equity, ownership of resources and participatory decision making. This can also be applied to

forest-related livelihoods in Ghana, and the importance of empowering individuals to improve the farmers' capacities to generate and maintain their means of living and enhance their well-being, as well as that of future generations.

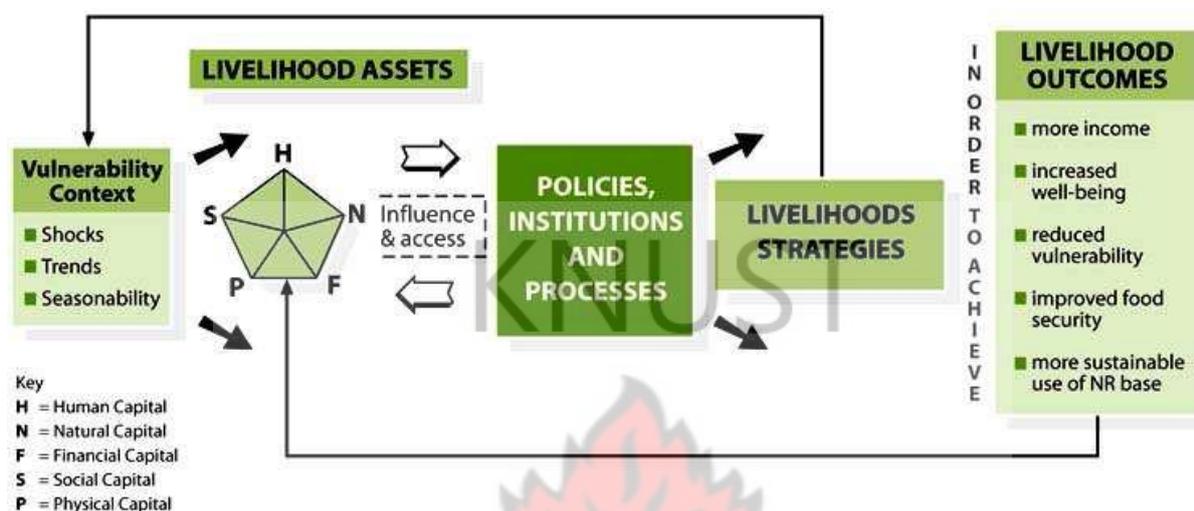


Figure 2.3 The Sustainable Livelihood Framework. *Source:* DFID (1999) Sustainable Livelihoods Guidance Sheets.

A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and contributes net benefit to other livelihoods at the local and global levels in the short and long term' (Chambers and Conway1992). According to Marfo *et al.*, (2002) in the fringes of the forest, livelihoods are built nearly entirely on the use of local natural resources, be it from farming, forestry, chainsaw operations, charcoal production, or hunting and gathering. The Forest of Ghana (both on and off reserve) provides both direct and indirect livelihood benefits to the entire population (Blay, 2008). The forest-fringe communities are thus vulnerable to changes in the environment and shifts in policy (Jennie 2009)

Ros-Tonen and Wiersum (2005) said that forest-based livelihoods have a different focus and different degree of dependence on forest resources, depending on the specific location of the village in terms of its proximity to the forest and its location vis-à-vis the market. It must also be emphasised that in the context of Ghana's High Forest Zone there are a lot of mixed landscapes that replaced the natural forest, example is areas where natural forests have been partly replaced with anthropogenic vegetation types with a combination of forest-based as well as agricultural activities as the main source of livelihood (Ros-Tonen and Wiersum 2005) which is importance to this study. The natural forest cover in Ghana's High Forest Zone has reduced drastically in the last century restricting the potential for forest and tree resource-based poverty alleviation.

Opoku (2006), reports that 60% of Ghana's population lives in forest-dependent communities and the people in forest-fringe communities are in an 'alarming' social condition. It is evident that the management of forests and trees can be crucial to improving the wellbeing of people in forest-fringe communities, where there are few opportunities and assets for improving livelihoods aside from the forest and the reforestation schemes under the new governance arrangements.

Sunderlin *et al.* (2003) outline developments that may impact and improve the potential of forests to alleviate poverty: decentralisation; forest tenure change; democratisation; anti-corruption campaigns; retreat of concessionaries; growing markets; market deregulation and liberalisation, new technologies and growing global environmental threats. Indeed Agyemang *et al.* (2003) discuss the general notion of the need to increase access to forest resources, provide security of tenure and optimize revenue generation. Agyemang *et al.* (2003) also discuss the manner in which poverty can be achieved at a rural level through the judicious use of forest resources, along with the equitable distribution of wealth, which fits in line with the

intentions of the MTS, hence the use SLA in the study to know if the development outline above has taken place in the implementation of the MTS to help alleviate poverty as one of the objective of the MTS.

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CHAPTER THREE

MATERIALS AND METHODS

3.1 Location of the Study Area

The Ashanti Region is centrally located in the middle belt of Ghana. It lies between longitudes 0.15W and 2.25W, and latitudes 5.50N and 7.46N. The region shares boundaries with four of the ten political regions, Brong-Ahafo in the north, Eastern region in the east, Central region in the south and Western region in the South west.

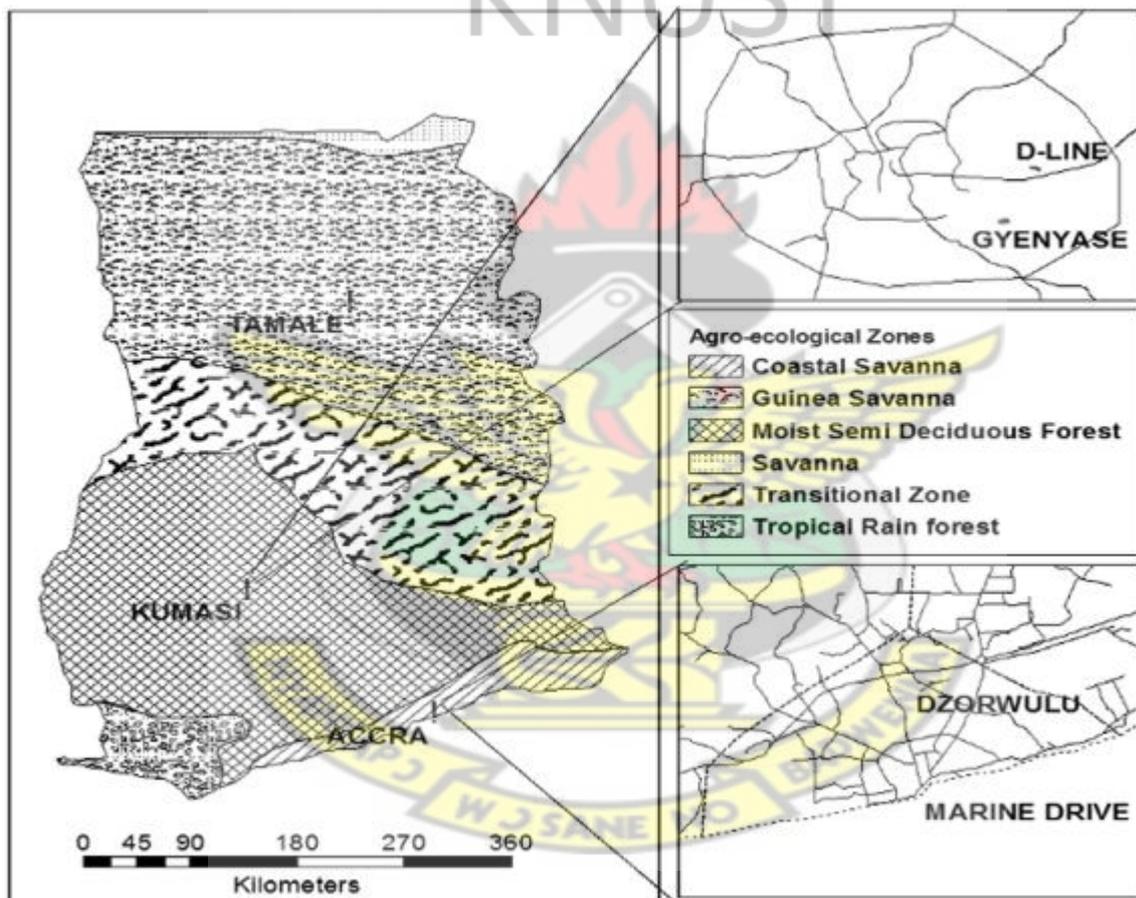


Figure 3.1 The different agro-ecological zones of Ghana (Source: Redwood, 2009).

3.1.1 Physical features

The region occupies a total land area of 24,389 square kilometers representing 10.2 percent of the total land area of Ghana. It is the third largest region after Northern (70,384 sq.kms) and Brong Ahafo (39,557 sq.kms) regions. The region has a population density of 148.1 persons per square kilometer, the third after Greater Accra and Central Regions. More than half of the region lies within the wet, semi-equatorial forest zone.

Due to human activities and bushfires, the forest vegetation of parts of the region, particularly the north-eastern part, has been reduced to savanna. The region has an average annual rainfall of 1270mm and two rainy seasons. The major rainy season starts in March with a major peak in May. There is a slight dip in July and pick in August, tapering off in November. December to February is dry, hot and dusty.

The average daily temperature is about 27 degree Celsius. Much of the region is situated between 150 and 300 meters above sea level. The region is drained by Lake Bosomtwe, the largest natural lake in the country, and Rivers Offin, Prah, Afram and Owabi. There are other smaller rivers and streams which serve as sources of drinking water for residents of some localities in the region. (www.ghanadistricts.com).

The High Forest Zone (HFZ) is in the southern most third; the Savannah region is in the North, which is the driest region, and the Transition Zone which falls between the two. The distinct vegetation zones are attributed to the regions' differing levels of rainfall and temperature. The (HFZ) is characterized by a huge variety of forest types from wet evergreen in the South West to dry semi-deciduous to the East (Treue, 2001). According to Wagner *et al* (2008), it is very rich and diverse in flora, containing over 70% of the floral diversity of the

country and forms part of the 'Biodiversity Hotspot' in the Guinean Forests of West Africa. Within the HFZ the agricultural landscape is dominated by a lot of small scale subsistence farming with annual crops like maize, cassava, cocoa, and cocoyam (Jennie 2009). Due to deforestation, the extent of forest within the HFZ is now estimated to be about 1.2 million ha., with the bulk of the remaining forest being located in the forest reserves (which amount to approximately 20% of the zone) (Treue 2001).

The study was conducted in four Forest districts in the Ashanti Region specifically Offinso Forest District, Bekwai Forest District, Kumawu Forest District and lastly Mampong Forest District.

Ashanti Region has seven forest districts. Five villages (four enclaves and one outside the reserve) were randomly selected from each of the four districts for data collection. In each District, eighteen people each from the four enclaves and eighteen from the outside reserved were interviewed.

3.2. DEMOGRAPHIC CHARACTERISTICS

3.2.1 Occupation

Agriculture is the major source of employment for majority of the people in the districts. Except in three districts, Agriculture provides employment to more than half of the economically active population in the region. Trade, which is the next most important economic activity in twelve districts, employs between 3.1 and 20.7 percent of the economically active population. Manufacturing is the second largest industry in terms of employment in the remaining six districts. (www.modernghana.com).

3.2.2 Site Selection

The community survey was preceded by the selection of forest districts through the assistance of technical officers of the Forestry Services Division (FSD). The villages or communities and the Forest District selected for the study was based on their active participation in the MTS. All the villages were numbered on pieces of paper, and the papers were folded and put in a hat, and were picked one at a time. The number corresponding to the village is now part of the sampling subset. Each number (village) is equally likely to get picked. Once it is selected the number is discarded. A village can be selected only once and this was repeated until the required numbers of villages were obtained. Total of five villages (four enclaves and one outside the reserve) each in the 4 forest district were chosen.

3.2.3 Reconnaissance surveys

To get a better insight of the study communities, reconnaissance surveys were conducted in all the selected communities. This stage was also used to gain acquaintance with the community leaders and to find out their willingness to allow the community members to participate in the study, to pre- test the questionnaires and to conduct a house count per community. Following the house count from the reconnaissance survey, the simple random sampling method of data collection was used to select interviewees from different houses in the communities for the individual questionnaire survey.

The reconnaissance visits were also used to select field assistants and enumerators to help in collecting field data. The field assistants were selected based on their local knowledge about the study area and the selected communities, ability to speak the local dialect and their level of education.

3.2.4 Review and analysis of secondary data

Prior to primary data collection, a thorough review and analysis of both published and unpublished secondary data was made. The various sources used included the 1994 Ghana forest and wildlife policy, the land-use systems in Ghana, several reports (both published and unpublished) at the Forestry Commission of Ghana provided additional information on the state of the MTS in Ghana.

3.2.5. Focus Group Discussion (FGD)

A number of focus group discussions (FGD) made up of ten in a group was held in each of the 20 study communities. The objectives were to gather background information about the communities which is not likely to be found in written documents, generate information on land-use patterns in the study area, and the use of the *PROFOR toolkit elements* to collect data for analysis to establish manners in which forests sustain the poor. The discussions were conducted in the local dialect (Twi), since majority of the local people do not understand English. Participants in the FGD included the community chief (i.e. head of the community), elders, assemblymen, teachers and community members attended the FGD in each of the study communities. The discussions were usually conducted during taboo days, because community members are by tradition not allowed to go to their farms to work on such days and therefore offer the opportunity to meet the community members.

3.2.6 PROFOR Toolkit Elements

A modified version of components of the PROFOR toolkit, the 'Poverty-Forests Linkages Toolkit' designed to facilitate relevant data collection and analysis with regard to efforts to establish manners in which forests sustain the poor was used. The toolkit has seven

components which can be used in order to assess the relative contribution of forest and tree-related activities to people's livelihoods. The modified sections of tools four, five and seven were used in order to facilitate the study. Tool four serves as a livelihood analysis and was used to assess the relative contribution of forest and tree-related activities to people's livelihoods. The participants ranked the components which make up both their cash and non-cash income. In each village 20 participants were involved: 10 female and 10 male MTS farmers were purposefully selected.

The farmers were given 20 small marbles and asked to divide them up according to their yearly income sources (both cash and non-cash terms) and this was assessed in relation to when they had not joined the MTS. The placement of the stones was recorded. The ranking facilitated a great deal of discussion among the farmers and served as a focus group, of which notes were recorded. Tool seven is essentially a matrix that enabled particular strengths and weaknesses of MTS to be revealed. The problems were then ranked according to their perceived prominence.

3.3 DATA COLLECTION

A mixture of both qualitative and quantitative methods was combined during data collection to benefit from the positive side of each of the methods. These methods were used to gather data from varied sources, including reviewing and analyzing secondary data, reconnaissance surveys, focus group discussions with community members, household socioeconomic surveys, interviews with key informants and experts.

Detailed information was obtained on the area under MTS, crops grown, production costs and farm maintenance costs, the annual outputs of cultivated crops, the unit price and gross

revenue per commodity, non-financial benefits of MTS and the extraction of firewood by conducting a household survey in 2005. Other issues discussed included the role of the government in MTS, the price (value) of trees and the benefit sharing arrangements.

3.3.1 Household socio-economic surveys

The studied area has a population of about 10, 000, people according to the 2010 Population and Housing Census. Using margin of error of 5% and confidence level of 95% a total 360 farmers were interviewed ,to obtain household socio-economic data using semi-structured questionnaires to both MTS farmers and non- MTS participants. The 360 respondents were made of 288 farmers who were participating in the MTS and 72 who were not participating in the MTS. Thirty other stakeholders including forestry officials, chiefs and opinion leaders were interviewed.

The surveys were conducted to obtain quantitative data that could be used to analyze if the objectives of the MTS have been achieved. Two different sets of questionnaires (i.e. one tailored to farmers who participated in the MTS and another one for farmers who did not participate in the MTS. The contents of the questionnaires were drawn up on the basis of a review of existing literature and discussions with key informants. Areas covered in the questionnaires included personal-demographic characteristics (i.e. details of the age, education, household size, wealth status, sources of income, etc.), household's livelihood activities and sources of income, asset endowments, responsibilities of the farmers, products gained from the MTS; livelihoods prior to the introduction of the scheme,) benefits obtained and perceptions of impacts on livelihoods,) problems faced by the farmers in the scheme.

The reasons for a farmer joining the MTS or not joining the MTS, reasons for planting a particular food crop, marketing of food crop, sources of labour, access to farmlands and extension services by Agric officers. Village contacts were made through the assistance of Range supervisor. Meetings were fixed one day in advance.

The simple random sampling of interviewees involved interviewing individuals from every other house.

3.3.2 Data Analysis

Crabtree and Miller (1992) said, data analysis strategies can be categorized along a continuum. At one end of the spectrum, the technique of analysis is seen as 'objective' in that they tend to isolate the researcher from the object of the research. At the other end, techniques exist that are subjective, context-dependent, interpretative and generative. Yin (1984) also suggests data analysis techniques that are suitable for case study research. This includes pattern-matching, explanation-building and time-series analysis. The type of data analysis to be conducted, however, depends on the type of data collected (i.e. whether qualitative or quantitative data and/or both). The present study employed a combination of qualitative and quantitative methods to analyze the field data.

The data analysis was done using the Statistical Package for the Social Surveys (SPSS) and Excel software. Other statistical techniques were used to explore differences and relationships between selected variables and groups of respondents e.g. T-test, a parametric test for comparing means of two groups was used to compare the annual income of households that participate in the MTS and households that did not participate in the MTS with particular emphasis on the percentage contribution of income from participating in the MTS.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Demographic Characteristics of the Respondents

Out of the 360 respondents surveyed 61 % were men and 39% were women. This finding is consistent with Ardayio-Schandorf (2007) which states that, the Ghanaian society is traditionally male-dominated, and the forest-fringe community in the sub-humid forest zone is of no exception.

The results as summarized in Figure 4.1 indicated that a far greater percentage of men go into MTS farming than women. This may be due to the fact that in most cases it is a joint venture between married couples but since it is accepted that the man is the head of the family, the man tends to claim ownership rights over the plot. Besides, in many parts of Africa, land ownership is mostly vested in men. Hence, women can plant their desirable crops on a parcel of land only when it is given to them as gift (Chavangi and Raintree, 1987). This might have resulted in the great imbalance in the gender ownership. Another reason, why there are more men in farming than women is that while women provide the majority of the labour in agricultural production, their access and control over productive resources is greatly constrained due to inequalities constructed by patriarchal norms ([www. wikipedia.org](http://www.wikipedia.org))

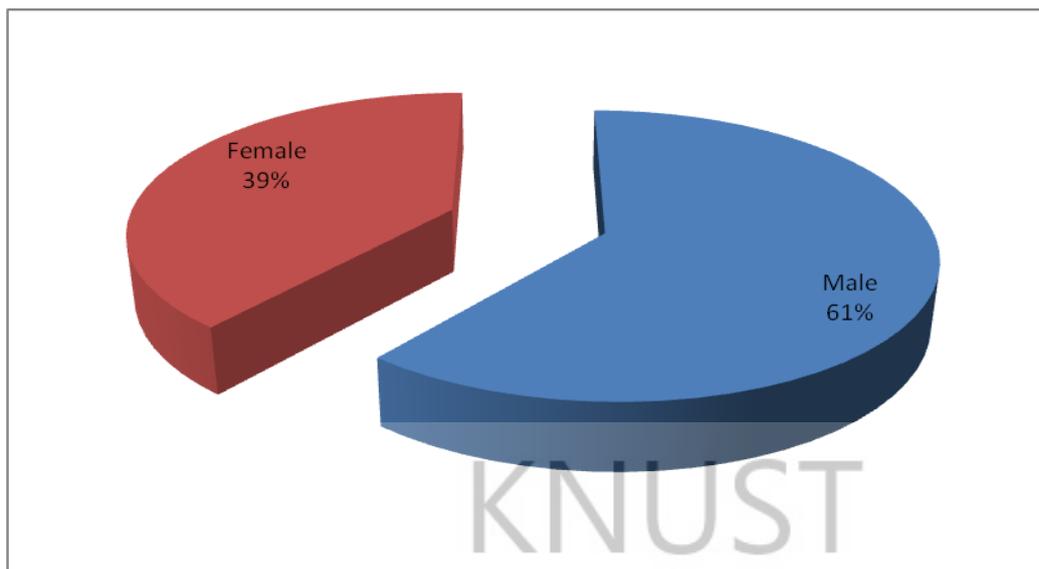


Figure 4.1. Percentage of men as against women participating in Modified Taungya System in the Sub-humid forest zone in Ghana.

Source: field survey,2005

The average household size (Table 4.1) is between 5-9 people per family which is consistent with the average household size in Ashanti Region which is 5.3 persons according www.modernghana.com.

Table 4.1. Household sizes distribution of taungya farmers in the studied communities.

Household size (Number of people)	Frequency	Percentage %
1-4	22.68	6.3
5-9	160.50	44.58
10-15	113.04	31.4
16-20	63.72	17.7
Total		100

Household size of taungya farmers (n=360).

Source: field survey,2005

The age of respondents ranged from 25 to 65 years with majority, 47 %, being in the middle age (40-49) category (Table 4.2). The age structure of the population in the districts is skewed towards the youth which is consistent with the general Ghanaian population (www.modern ghana.com).

Table 4.2. Age distribution of the respondents of the survey in the forest fringe communities in the sub-humid forest zone in Ghana

Age	Frequency	Proportion (%)
20-29	43.03	11.95
30-39	88.20	24.50
40-49	170.39	47.33
50-59	43.38	12.05
60-69	14.328	3.98
N= 360		

Source: field survey,2005

About 42% had some form of formal education (Fig.4.2), which is the national average according to Fifth Round of the Ghana Living Standards Survey (GLSS 5) which states that almost 70 percent of adults in urban areas are literate as against 40 percent of adults in rural areas. Fifty-eight percent (58%) of the respondents did not have formal education.

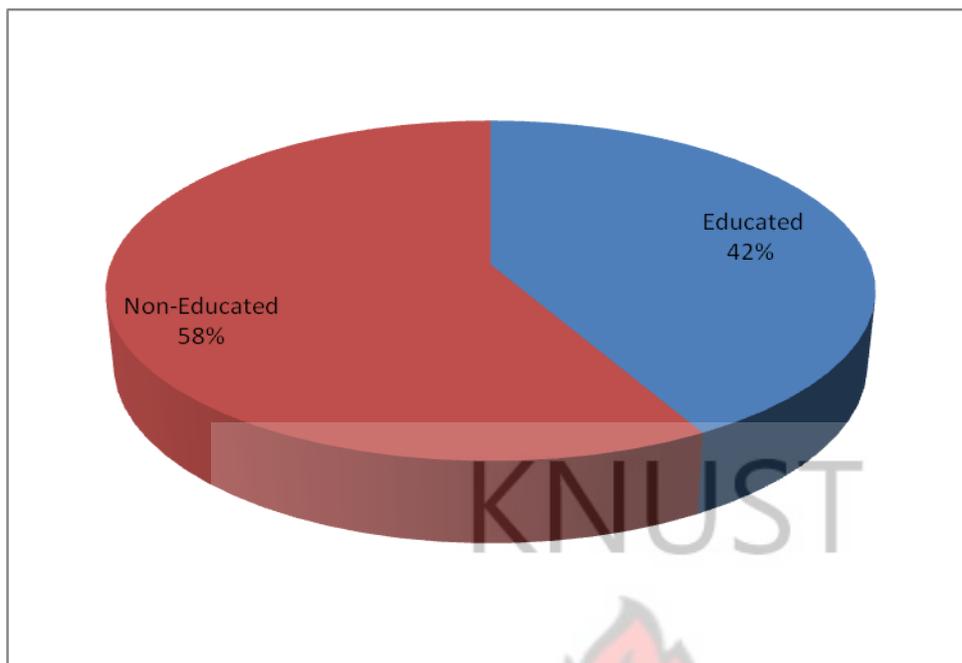


Figure 4.2. Percentage of educated and non-educated people in studied communities participating in the Modified Taungya System in the Sub-humid forest zone in Ghana.

Source: field survey,2005

Several reasons account for the low educational level of respondents (Table 4.3) which corroborates Madez *et al* (2007).

All these situations pertains in the study areas and might be the reason for the low enrollment at school in the forest fringe communities in the sub-humid forest zones in Ghana.

For many years farming has been the preserved of illiterates and semi-literates in the West Africa sub-region. According to GLSS5 Agriculture/fishery workers, craft and related trade workers, and service/sales workers report large proportions of low (less than MSLC/BECE) or no educational attainment as shown by the result of the survey. Interest in farming shown by literates in general is quite recent. It is therefore not very surprising to note that none of the farmers had had tertiary education and even those with secondary education were the least (8%).

Table 4.3 Reasons for Low Level of Educational Enrollment in the studied area

Reasons for not attending school	Number of respondents
Inadequate Teachers	233
Insufficient Infrastructure	275
Unfavourable socio-economic and cultural factors	283
Geographically hard to reach areas	189
Low enrollment of children with disability	130

Source: field survey,2005

The economically active population in the region is engaged mainly in Agriculture (Fig 4.3), (excluding Fishing), which employs about 44.5 % of the people. The next highest proportion of the economically active population is employed in Wholesale and Retail Trade (18.4%), followed by Manufacturing (12.2%) and Community, Social and Personal Services etc., (9.9%) (Fig4.4). These four major economic activities employ a total of 85% of the economically active population. From the survey farming is the predominant occupation of most the local people around the reserves and the major cash crop is cocoa. The reports indicated that farming (especially cocoa farming) is the main economic activity of the forest-dependent communities around the reserve.

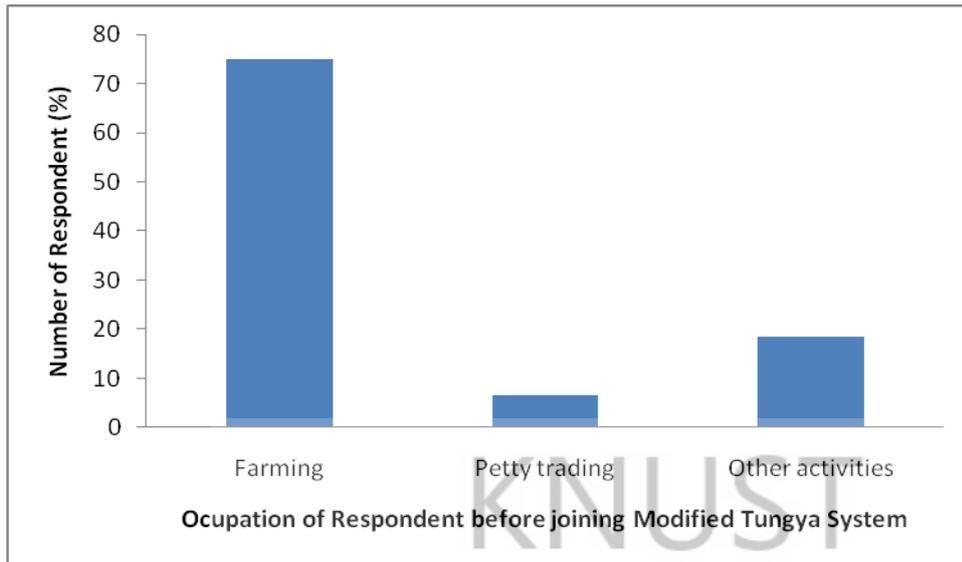


Figure 4.3. Occupations of respondents in the studied communities before joining the Modified Taungya System in the sub-humid forest zone in Ghana.

Source: field survey,2005

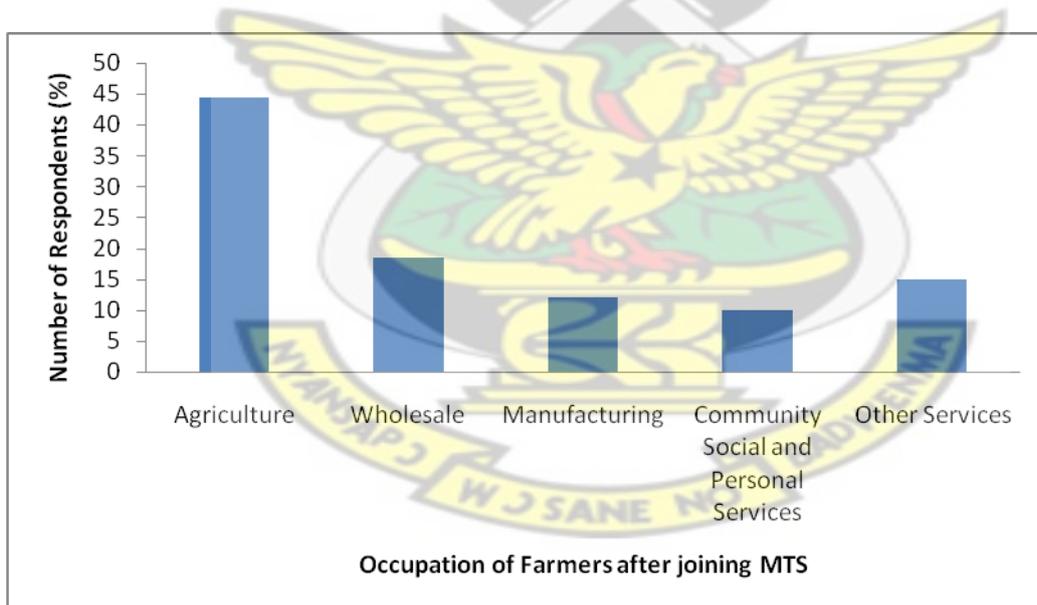


Figure 4.4. Occupations of farmers in the studied communities after joining the MTS.

Source: field survey,2005

4.1.2 Views on benefit-sharing framework strategy

In all the study areas, the farmers were aware of the rent-free land for farming, retention of all proceeds from the food crop cultivation and the benefit-sharing framework. However, most of these farmers (85%) claimed they were unaware of exact proportions of the benefits (Fig 4.5).

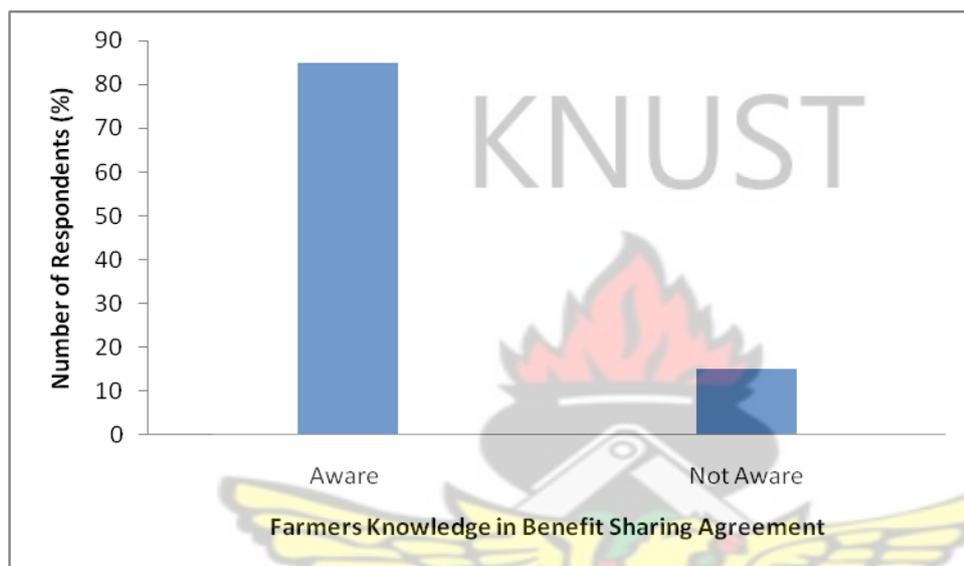


Figure 4.5 .Percentage of farmers in the studied communities participating in the modified taungya system indicating awareness of the exact proportions of the benefit share agreement.

Source: field survey,2005

About 76% of the respondents who were practicing MTS indicated they agree to the benefit-sharing arrangement, and it seeks the interest of all stakeholders. However, 24% said the benefit-sharing arrangement is good but not the best (Fig 4.6).

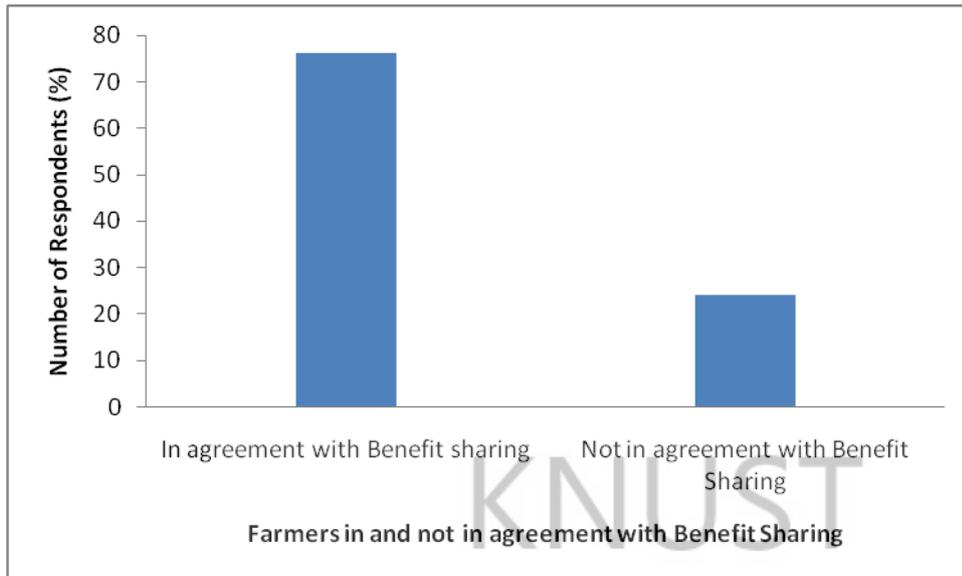


Figure 4.6. The number of farmers in the studied communities who are in agreement with the benefit sharing agreement and those who are not in agreement with the benefit share agreement.

Source: field survey, 2005

The farmers who are not in agreement with the benefit share agreement recommended for a change in the arrangement because they perceive that more work is reposed on farmers than on the other stakeholders. They proposed that 50% of the benefits should accrue to farmers and 50% to the other stakeholder. According to Agyemang *et al.* (2003), one reason for which the taungya system was abandoned was that the farmers left their plots after canopy closure and FSD could not maintain the plots due to lack of finance. The re-introduction of the taungya and the incorporation of the benefit sharing agreement were to make sure the farmers remained on their plots after canopy closure to tend and protect the trees planted.

From the survey about 95 % (Fig.4.7) of the farmers stayed on the land after the canopy closure to protect and managed the planted seedlings which are consistent with the reason for the benefit sharing frame work. Those who left the land (5%) are settler farmers who had

either left or had abandoned their farm because they are skeptical about the benefit sharing framework.

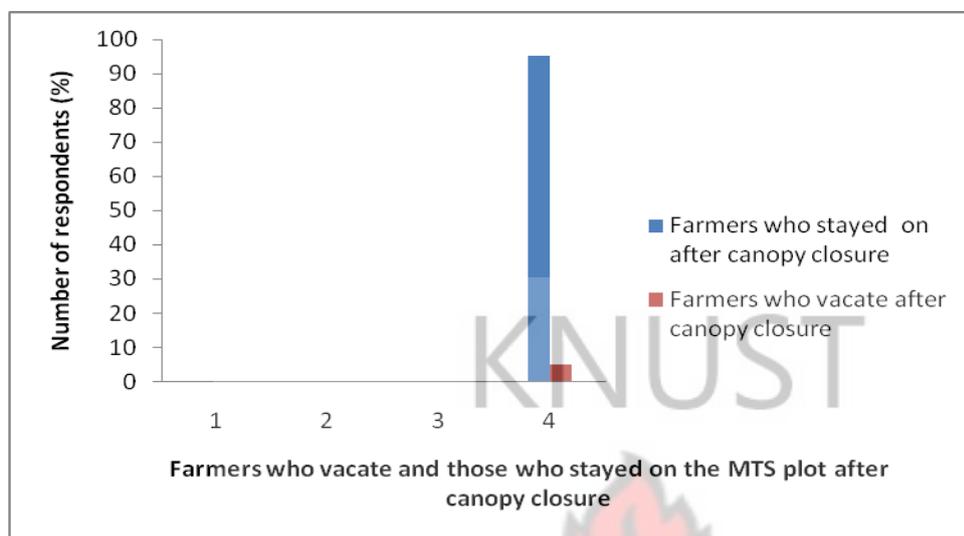


Figure 4.7: The number of farmers in the studied communities participating in the Modified Taungya System who stayed on the land and who left the land after canopy closure.

Source: field survey,2005

4.1.3 Responsibilities on Stakeholders

The results shows that all the respondents knew their responsibilities in the Modified Taungya System(MTS) i.e. to plant and then take care of the tree species and the crops,i.e , weed , maintain the trees and replace dead seedlings, protect the trees from fire in the dry season, and from encroachment or chainsaw operation. Such activities are prerequisite for successful Taungya system and for that matter MTS (Lamb, 1967). The Farmers also knew the appropriate companion crops that should be planted in between the trees. Cassava especially was singled out as a crop that farmers are not allowed to cultivate in between the seedlings because it grows rapidly, overshadows the planted seedlings and thus retard their growth. The farmers knew that it was the responsibility of the FSDs to provide requisite

seedlings, pay for peg cutting, pegging and nursing of the plant seedlings. This was partially done on the onset of the programme but payment discontinued in the subsequent years.

Apart from the technical expertise and training for farmers, farmers were unaware of FSD's responsibility to contribute equipment and tools, take inventory and marketing of products while the traditional authorities contribute land. The communities would provide support services such as protection of investment from fire (FAO, 2003). These responsibilities are unknown to some members of the community; however, 79% of the MTS farmers are aware of the community's role (Fig. 4.8).

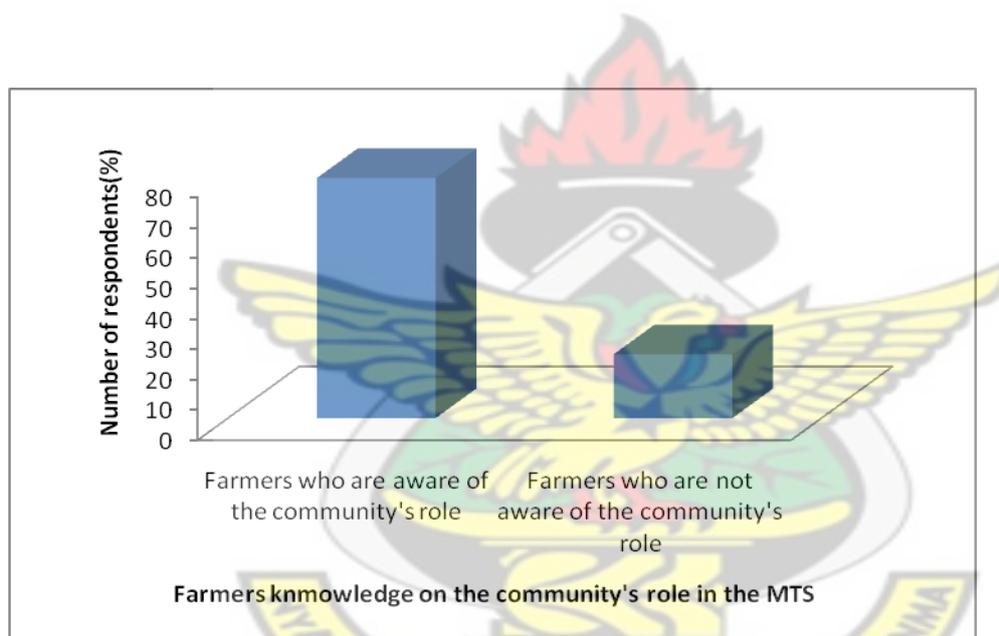


Figure 4.8. Number of farmers in studied communities who know the community's role and those who do not know the community's role in the Modified Taungya System

Source: field survey, 2005.

All the respondents mentioned that FSD gave them technical training, particularly in planting trees interspersed with food crops, technical support on selecting suitable soils, spacing and the number of tree seedlings per hectare as stated in the benefit sharing agreement (Agyemang *et al* 2003). Farmers were also educated on the crops used in mixed farming that

is compatible with teak trees. For instance, cassava crop is incompatible with teak hence; intercropping cassava with teak is discouraged. However, none of the farmers was trained in other income generating activities, such as mushroom growing, bee-keeping and snail rearing, which aims at assisting farmers to be self-sustaining when tree canopy disallows continuous crop cultivation in the taungya farms.

4.2 THE ABILITY OF THE SYSTEM TO ATTRACT FARMERS / EMPLOYMENT

Job opportunities created under the MTS can be categorized into two – full time and casual by-day jobs. The full time jobs were in the form of farming opportunities granted to peasant farmers from forest-fringe communities. The casual by-day jobs were offered mainly for activities such as site preparation, peg cutting, pegging, seedling production, and planting.

The income coming from Seedling production is higher than the others (Table 4.3) and it is normally done during dry season when no farming activity is taking place, Seedling production offered the highest number of jobs (Table 4.3) as against the other activities like peg cutting, pegging, etc. and as such more people get attracted to it.

Table 4.4. Rate per activity offered by the Modified Taungya System to farmers in the studied communities.

Activity	Cost per unit
Site Preparation	Not paid
Seedling Production	0.3 Ghp /seedling (Stump)
Seedling Production	0.5 Ghp/ seedling (Potted)
Peg cutting	0.1 Ghp /peg
Pegging	Ghc 10/ ha
Planting	Ghc 10/ ha

Source: FSD 2003

It was observed that many farmers seem to over concentrate on some activities because the incomes they bring in are more than others. According to David Appiagyei (2004), farmers earn more from seedlings production than peg cutting which at times delay pegging and subsequently delay planting out. (Table 4.3). In other instances farmers demonstrated lukewarm attitude towards work stemming from uncertainties about the anticipated benefit sharing arrangements. The modify Taungya System annually provides on the average 900 jobs to the people in the study area from 2001-200 (FSD 2005).

Table 4.5: Breakdown of casual labour offered in the studied communities by the Modified Taungya System.

Activity	Number of People employed	Percentage
Peg cutting	43.77	15.20
Seedling Production	136.54	47.41
Pegging	84.18	29.23
Planting	23.50	8.16
Total	288	100

Sources: SD 2004

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4.3 FARMERS RATIONALE FOR JOINING THE MTS

The farmers gave the reason(s) for participating in the MTS in order of importance as (i) increased access to food crops, (ii) improved livelihood, and (iii) access to farming land (iv) concern for the environment (v) income (vi) children's education (Table 4.5). From Table 4.6, it could be mentioned that access to land and access to food are of great interest to the people. These dominate the reasons why people join the MTS. Access to land provides extra farmland which enhances employment, increase farm holdings and boost food production and farm income. Another reason for the high percentage of respondent in the livelihood category is the believe that, increase in land holdings would lead to a sharp decrease in relative deprivation for the rural family. Furthermore, the land reform of the NFPDP is in line with the interventions proposed by both basic needs strategy and relative deprivation concept, which posit that rural poverty in the Third World would be alleviated when there is comprehensive land redistribution policy, (Webster 1990). The acquisition of MTS farm lands increases farm holdings of MTS farmers as compared to non-MTS farmers. This has the potential to improve food production, increase income and ultimately reduce poverty.

Another reason given by farmers is that access to land and other capital resources has the potential to improve their welfare.

According to Krantz (2001) raising quality of life is not a matter simply of improving the incomes of the poor, and this accounts for the reason why only 6% (Table 4.6) of the farmers joined the MTS. The capacity to provide for themselves and lifting themselves out of poverty by such factors like access to land, which helps them to enhance their ability to provide for themselves takes precedence over income .



Table 4.6: Reasons explained by Farmers Joining the Modified Taungya System in the studied communities

Reason	Number of participants	Percentage
Access to food crops	288	70
Improved livelihood	288	73
Access to Land	288	79
Concern for the environment	288	21
Income	288	6
Children's education	288	6

Source: field survey,2005

4.4 FOOD PRODUCTION UNDER THE MODIFIED TAUNGYA SYSTEM (MTS)

Food crops cultivated on the MTS plot included: plantain (all MTS farmers), cocoyam (49%), maize (72%) and vegetables, including tomatoes, peppers, okra, garden eggs, and onions (11%). Essentially all of the staples of the Ghanaian diet were allowed except cassava that the farmers were not allowed to cultivate under the MTS Scheme. In the past, there was bias towards the cultivation of cash crops and resulted in severe food shortage, (Okurume, 1970). Food production increased dramatically in the studied area (Table 4.7) since the inception of the MTS as was expected by the programme due to the inherent high fertility of the forest soil. As most of the farmers could not afford fertilizer, the degraded reserve offered a better choice of farm land hence the increased in food production (Table 4.7) which collaborates the findings of Nao (1978).

Table 4.7: Food production in the studied area from 1994-2004

Year	Area under production(ha)	Food production (mt)
1994	63,792	247,102
1997	73,416	856,727
1998	79,348	718,425
1999	98,984	941,310
2000	128,408	1,319,742.45
2001	335,400	1,498,451.50
2002	350,628	2,504,900
2004	362,146	2,472,200.73

Source: Ministry of Food and Agriculture, 2004 unpublished

Crop yield from MTS areas were observed to be higher than off-reserve due to high soil fertility in the MTS area. In 2004, the yield of maize was 1.2 t per acre (Table 4.8) which is far in excess of what was estimated by Asiamah (2003).

The planting distance used in the study area is 3meters by 3meters, the close spacing between the trees may depress food crop yield. This may also account for lower than expected yield from the MTS plot (Table 4.8) as observed by Brookman-Amisshah (1978) and FAO (1967).

To compare the crop yield from the degraded forest reserve and the off – reserve, a paired sample t-test was applied to the differences in area of forest reserve and off-reserve held by farmers and was significant at the 1% level.

From the Table 4.8 the yield per acre in the forest is higher than the off-reserve. The reason may be due to the fact that the soil in the reserve is more fertile than those in the Off-reserve hence the higher yields. With other food crop such as plantain, cocoyam and yam, the low yield in the Off-Reserved is attributed to the fact that, the farmers reduce the planting density since they can not afford fertilizer in the relatively low fertile soil.

Table 4.8: Comparing crop yield from Modify Taungya System (Forest Reserve) and Off-Reserve areas in the sub –humid forest zone of Ghana

Crops	Forest Reserve Yield/acre	Off-Reserved Yield/ acre
Maize	12 maxi bags	10 maxi bags
Plantain	400 bunches	300 bunches
Cocoyam	10 mini bags	6 mini bags
Yam	800 tubers	600 tubers

Sources: Ministry of Food and Agriculture, 2004 unpublished.

Although it is difficult to estimate the total food production in the studied area, the implementation of MTS enhanced food production in the country (FC,2006). From 2003 to 2005, for example, the plantain harvest was about six-fold (634%) greater than the expected output. Common crops cultivated by farmers include pepper, okra, plantain, maize, cocoyam, yams, cassava, tomatoes, cabbage and groundnut.



Plate 4.1. Teak seedling planted with cocoyam

Source: field survey,2005

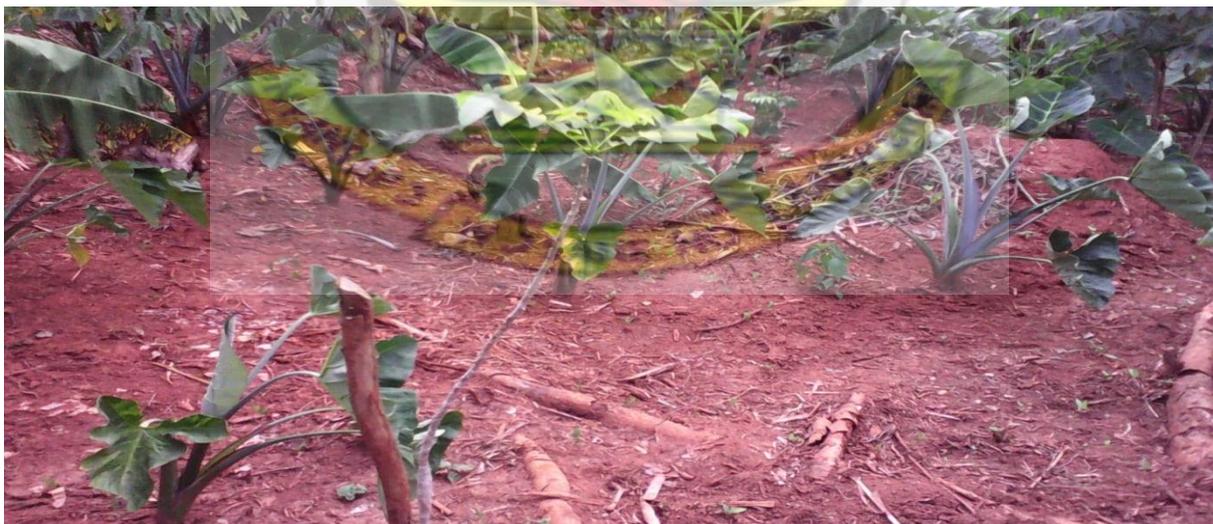


Plate 4.2. Cedrella seedling planted with plantain and cocoyam

Source: field survey,2005

4.5 INCOME GENERATION

The main sources of income are from the sale of surplus food crops harvested from the farm (Fig. 4.9). However, there is occasional income from harvested NTFPs from the forest. The farmers reported that they are able to make a reasonable income from the agricultural crops obtained from the MTS, since the crops belong to them and they collect all the revenue from their sale. Some of the produce are used for home consumption, and hence form a non-cash component of their income.

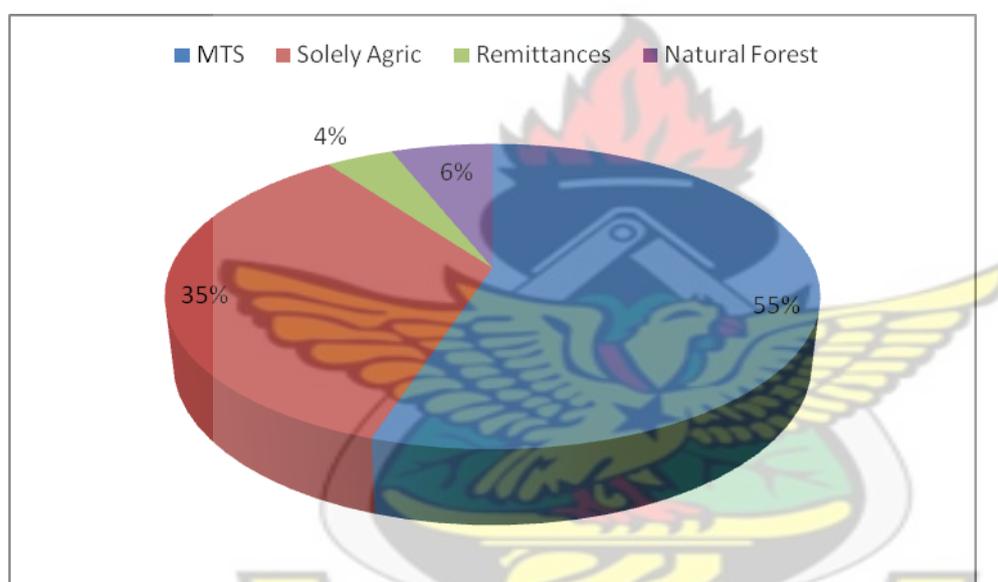


Figure 4.9 Main sources of income of farmers from the studied area

Source: field survey, 2005

The MTS has been able to bring a lot of income generation activities apart from the farming (Fig.4.4).

Notably among them are selling of agro inputs such as weedicide, cutlasses, etc. Within the studied communities the farmers are able to access more products and to have more physical

capital from the cash and non-cash income provided by the agricultural products due primarily by the MTS (Fig. 4.10).

There is an improvement in the standard of living which is manifested as farmers having more assets, large landholding, and children attending good schools, and having more than one source of income (Table 4.9).

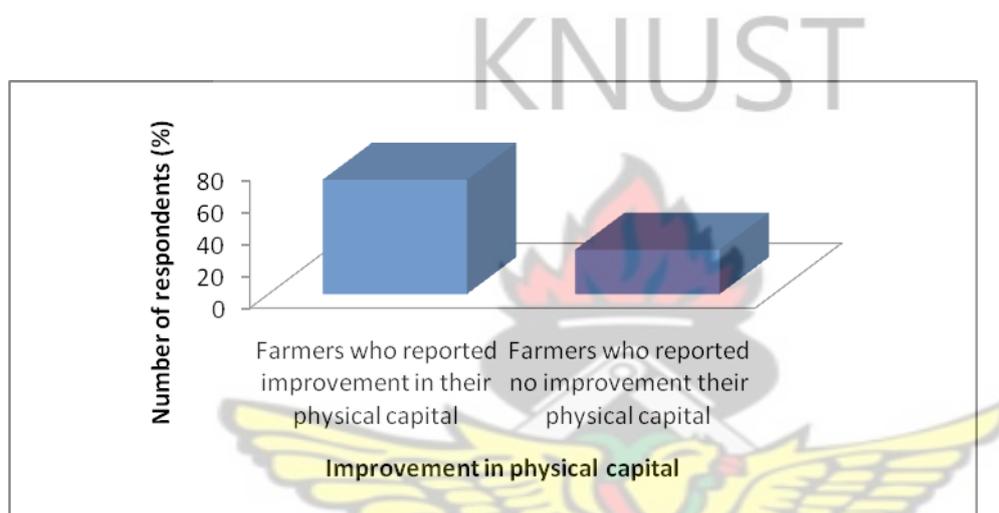


Figure 4.10 Number of respondents in the studied communities who reported improvement in their physical capital and those who did not experience marked improvement in their physical capital.

Source: field survey,2005

Table 4.9: Number of respondents who reported improvement in their standard of living in the study areas

Criteria	No. of people who reported Improvement in their standard Living	Percentage
Size of Landholding(5-10 acres)	207	72
Level of Food sufficiency(Able to meet family food needs at least 10 months per year)	199	69
Children's Education(Able to send children beyond primary school.)	216	75
Assets(Many household assets)	193	67
Farmers who have more than one source Of income	150	52

n=288

Source: Field Survey,2005

It was observed that there is a lack of diversity, among the farmers engaged in the MTS. The farmers rely mainly on crops from the MTS as their livelihood in the community. One objective for the introduction of the MTS is to provide income and thereby reducing poverty through livelihood enhancement. From the results, the farmers derive little income from the natural forest, sizeable amount of their cash and non-cash income, come directly from participating in the MTS .In case there is suspension like the previous Taungya system, the farmers ability to cater for their families will be seriously in danger, thus their livelihood will not be sustained. This calls for support activities to improve the sustainability of livelihoods among poor and vulnerable groups by strengthening the resilience of their coping and adaptive strategies (Krantz 2001).

The PROFOR toolkit was used to analyse the contribution of the MTS on livelihoods, using ranking and looking at the components that make up both the cash and non-cash income of people in the forest fringe communities.

The produce from MTS - cocoyam, plantain, maize and vegetables are their main source of income (both cash and non-cash), followed by income from land exclusively used for farming (Figs.4.11 and 4.12). Products derived from natural forest and fallow lands were of minor importance (Figs.4.11 and 4.12).The areas where farmers derived income were divided up into the Natural Forest, the MTS, solely agricultural land and fallow lands, wages and remittances.

The relative importance of the MTS, particularly in terms of its cash and non-cash contribution to the livelihoods of farmers was 50% and 54% (Figs.4.11 and 4.12).

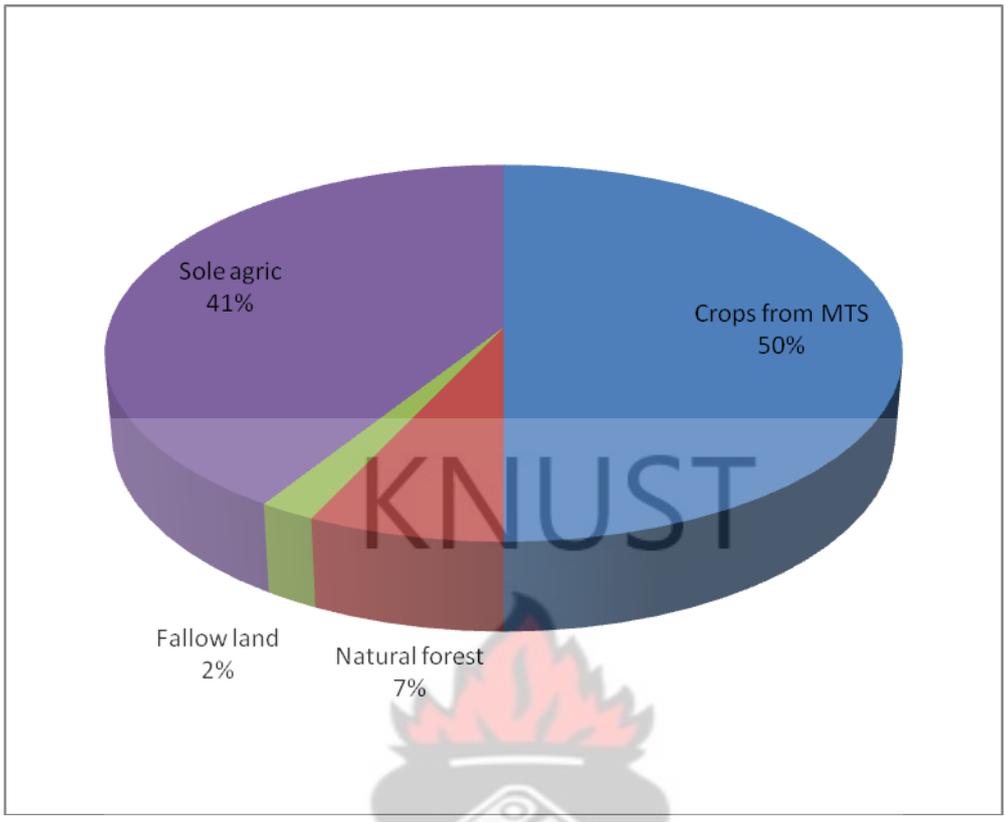


Figure 4.11 Cash component of livelihood of respondents in the studied area

Source:Field Survey,2005

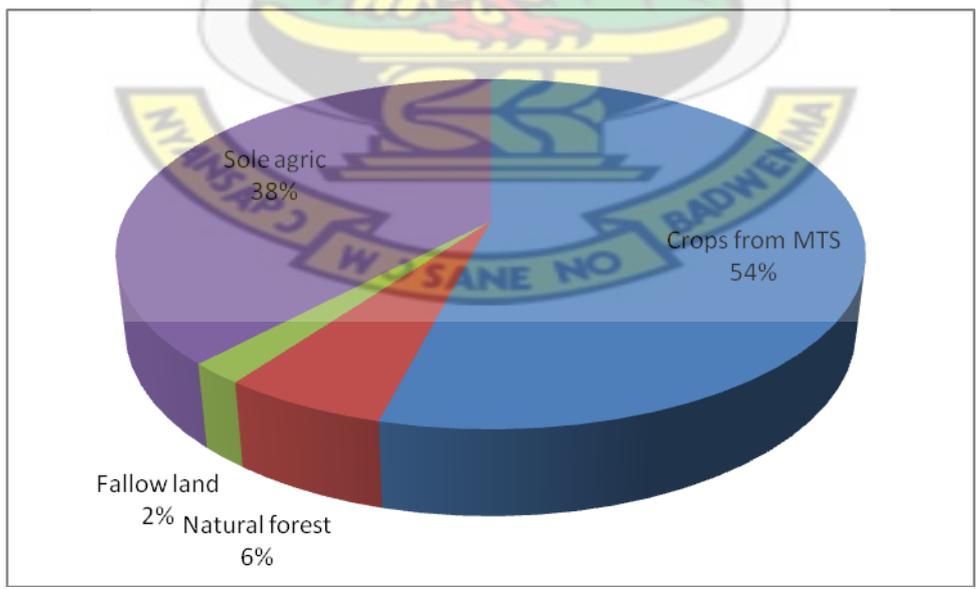


Figure 4.12 Non- component of livelihood of respondents in the studied area

Source: Field Survey,2005

From (Figs.4.13and 4.14), women relied on the crops of the MTS and derives hardly any income from products harvested from the natural forest (8% cash,3% non-cash) and from fallow lands (5% cash,9% non-cash).The crops from the MTS forms the non-cash component for the women since most of the yield is used to feed the family. According to wikipedia.org, women are usually engaged in subsistence farming to provide food to fulfill the needs of the members of household while men are engaged in production of cash or export crops. This distinction can be explained as a result of gender norms that assign women with the responsibility of feeding family and men with the responsibility of providing cash income.

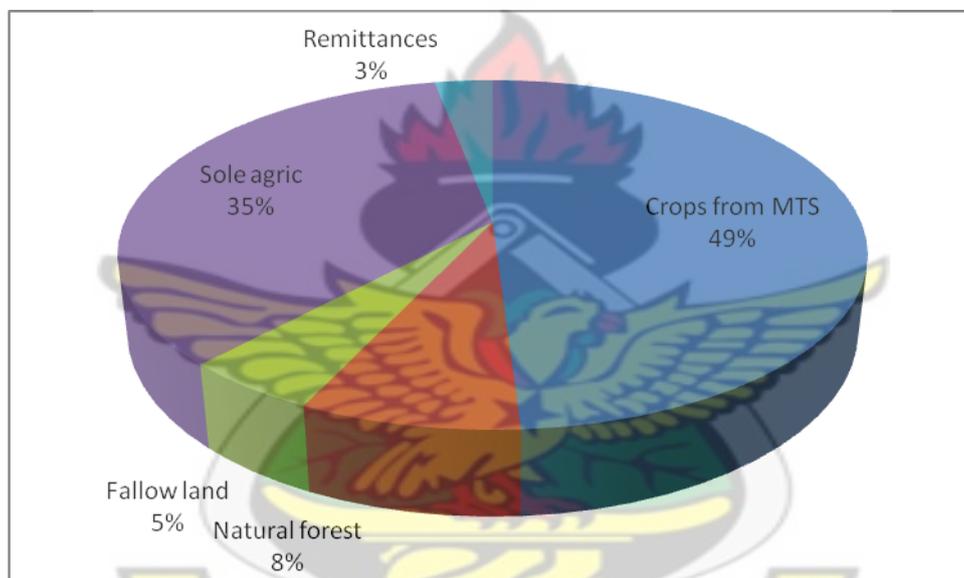


Figure 4.13 Non-cash component of livelihood women in the studied area

Source: Field Survey,2005

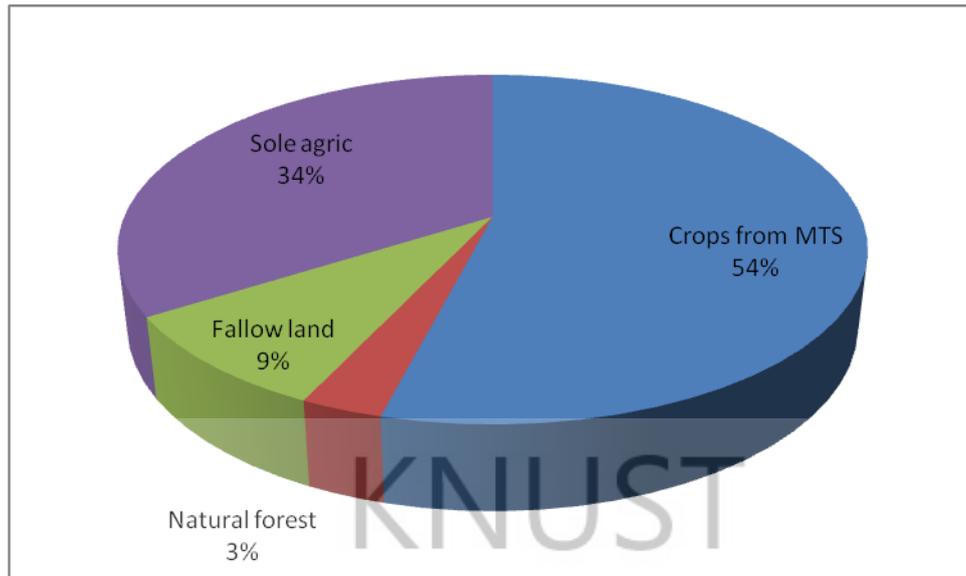


Figure 4.14 Cash component of livelihood women in the studied area

Source: Field Survey, 2005

The analysis (see Figs. 4.15 and 4.16) showed that the male also rely on the products derived from MTS as a source of cash and non-cash income (47% and 43% respectively) and they derived greater percentage of their income from farming on other land outside the reserve (52% of cash and 48% of non-cash income respectively). Products derived from natural forest and fallow lands were of minor importance.

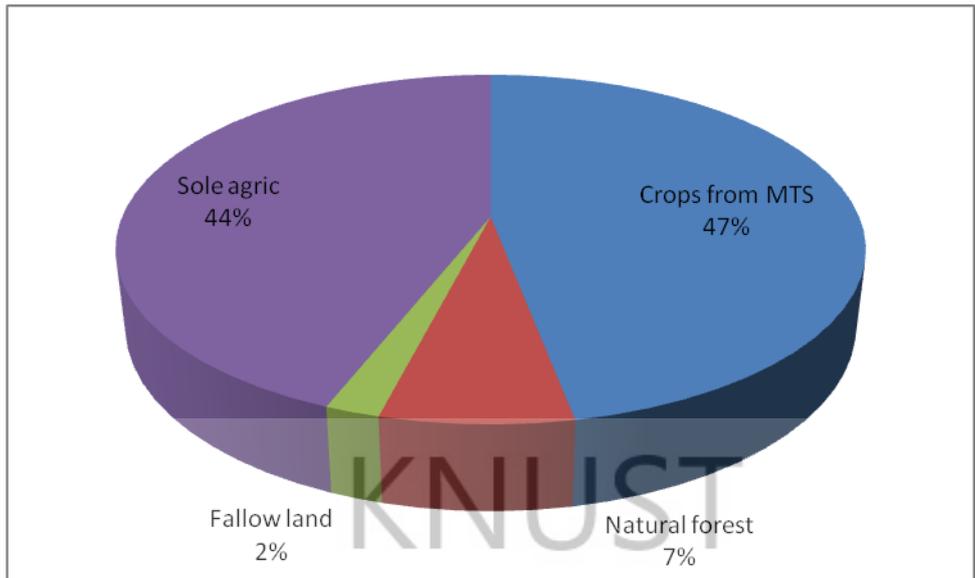


Figure 4.15 Cash component of livelihood of men studied area

Source: Field Survey, 2005

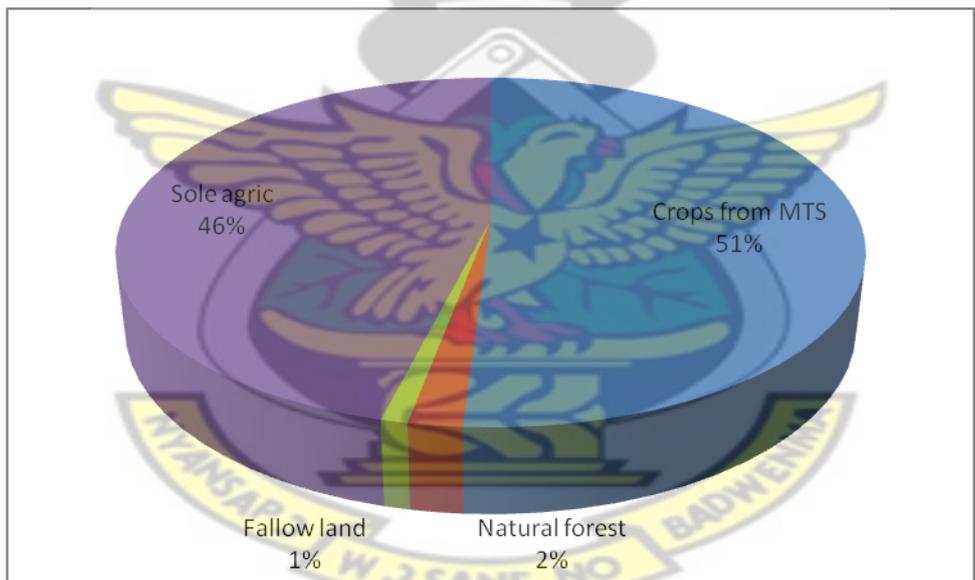


Figure 4.16 Non-cash component of livelihood of men studied area

Source: Field Survey, 2005

The analysis shows that women derive much benefit from the MTS and this is explained by Ardayfio-Schandorf (2007) stated that women in Ghana constitute 52% of the agricultural workforce and produce 70% of the subsistence crops and due to the gender structures and socio-cultural environment, women in rural areas lack access to and control of economic

assets like land and credit. The MTS has thus created an avenue for the women to enhance their livelihood.

The forest fringe communities certainly made use of the forest, for food, for firewood, for building materials as well as it serving a cultural purpose in time past. Their livelihoods were built almost entirely on the use of local natural resources in farming, forestry, as well as hunting and gathering of forest products and NTFPs. However in recent years, forest degradation has reduced the amount and ease of accessing products from the forest (for example bush-meat), reducing the ability of the people in forest communities to access these products and negatively impacting their livelihoods.

4.51 Financial Benefit of the tree components of MTS

The findings indicate that MTS, is a profitable venture (BCR >1)

Table 4.10 Cost incurred by MTS farmer in establishing an acre of teak

S/N	Rate/ acre GH¢	Total GH¢
Land Demarcation	Free(Done by FSD)	
Cost of land	FSD provides Land Freely	
Land	100.00	100.00
Preparation/clearing		
Peg Procurement	Paid by FSD	
Pegging	Paid by FSD	
Seedlings Procurement	Paid by FSD	
Planting	Paid by FSD	
Cost of pruning		
Tending(First three years)	2* 3*40 GH¢ (done 2 times a year for 3 years)	240.00
Total		340.00

Source: field survey,2015

Expected Revenue from one acre of 25 years teak plantation

Number of Trees per acre	=444
Estimated volume per tree at 25years	= .9m ³
Price per cubic meter	= GH¢ 245.00
Expected Revenue	= 444*.9*245
	= GH¢ 97,902

Per the benefit share agreement, farmers are entitled to 40% of the final crop of trees

$$\begin{aligned}
 & 40\% \text{ of } 97,902 \\
 & = 40/100 * 97,902 \\
 & = \text{GH¢ } 39,160.8 \\
 \text{Less the initial cost of establishment} & = \text{GH¢ } 39,160.8 - \text{GH¢ } 340.00 \\
 & = \text{GH¢ } 38,820.8
 \end{aligned}$$

The expected revenue for each MTS farmer after twenty-five years of participating in the MTS and provided the numbers of trees per acre are as estimated above.

4.6 LIVELIHOOD BENEFIT

According to FAO (2003), the MTS has the potential to contribute positively to people's livelihoods, as a result of increased access to land and the ability to grow and earn income from agricultural crop based on it's six strategies that it believes hold promise in terms of the potential of poverty alleviation:

People-centered forestry; Improvement of tenure and regulatory systems;

Improvement of marketing arrangements; Partnerships (between small holders or communities and the government, NGOs, the private sector);

Redesign of transfer payments (for example payments for conserving forest, could go to those in the forest-fringe community as opposed to government agencies); Integration of forestry into rural development and poverty reduction strategies.

About 88% of Modified Taungya System (MTS) farmers said their previous occupation was farming or farming related; 78% were cocoa farmers and engaged in plantain and vegetable farming; about 2% reported petty trading (Table 4.11).

There were other sources of income to the MTS farmers: cocoa farming, citrus farming, barbering, carpentry, cassava farming, chicken and goat rearing on their land. Occasional remittances from relatives accounted for another source of income as well.

Table 4.11: Previous occupation of respondents before joining the Modified Taungya System.

Occupation	Percentage
Cocoa Farming with food crops	179
Food crop farming only	82
Petty Trading	10
Other occupation examples, carpentry etc.	17
N=288	

Source: field survey, 2005

Eighty- one percent saw the MTS as a reliable sources of income, hence a major livelihood option, whereas 19% saw it as a safety net. The finding is in agreement with (NEPAD, 2002) which states that in rural areas, where agriculture is the mainstay of all people, it supports 70-80% of the total population, including 70% of the continent's extreme poor and undernourished. Improvement in agricultural performance has potential to increase rural

incomes and purchasing power for large number of people. Thus, more than any other sector, agriculture can uplift people on a mass scale, as seen by higher percentage claiming the MTS as reliable sources of income.

The basic measure of success for projects and policies is the extent to which they have enabled individuals, households and communities to strengthen sustainable livelihoods for themselves (Anne 2000). This corroborates the findings of the study where, majority of the MTS participants reported that they are able to provide for their household's daily care. A shift from a 'food first' perspective to a livelihood perspective, which focuses not only on the production of food, but also on the ability of households and individuals to procure the additional food they require for an adequate diet (krantz 2001). From the study it can be argued that the MTS has a positive effect on people live. The income generated from the agricultural crops enables farmers improve their standard of living. It is feared however, that amount of income the MTS provides will not continue once the trees overshadow the crops.

Access to farm produce and land for farming has improved considerably and majority of farmers are able to afford their children's education since joining the MTS as shown in Table 4.11. About a third of MTS participants reported putting up a building was easier (Table 4.12).

From Table 4.12 presents results of people evaluation of the MTS. The people in the category of better off are higher among those who participate in the MTS as compared to those who did not participate in the MTS. The reason may be attributed to other income benefit gained from participating in the MTS. The trend goes on in other categories indicating there are more to gain from participating in the MTS.

Table 4.12: Ranking of household participating in MTS and household not participating in MTS as either better off, average or poor in the studied area.

Total	Households participating in the MTS			Households not participating in the MTS		
	Better-off	Average	Poor	Better-off	Average	Poor
number of household						
Total number in the category of 360 household	25	70	73	21	56	116
Percentage of household in the category	6.8	19.3	20.3	5.8	15.6	32.2

Source: Field Survey,2005

(N=360)

From figure 4.17 there is a significant improvement in the livelihood of MTS farmers as compared with non-MTS farmers. They have increased their livelihood outcomes, as many now have capital for other ventures. Furthermore, MTS farmers acquired increased range of assets as compared with their non- MTS counterparts. This gives the former an advantage over the latter concerning opportunities to engage in more secondary occupations and better their well being in the long term.

The standard of Living of MTS farmers have improved as they are better able to afford their children education, able to put up houses, afford household daily care etc (Fig. 4.17).

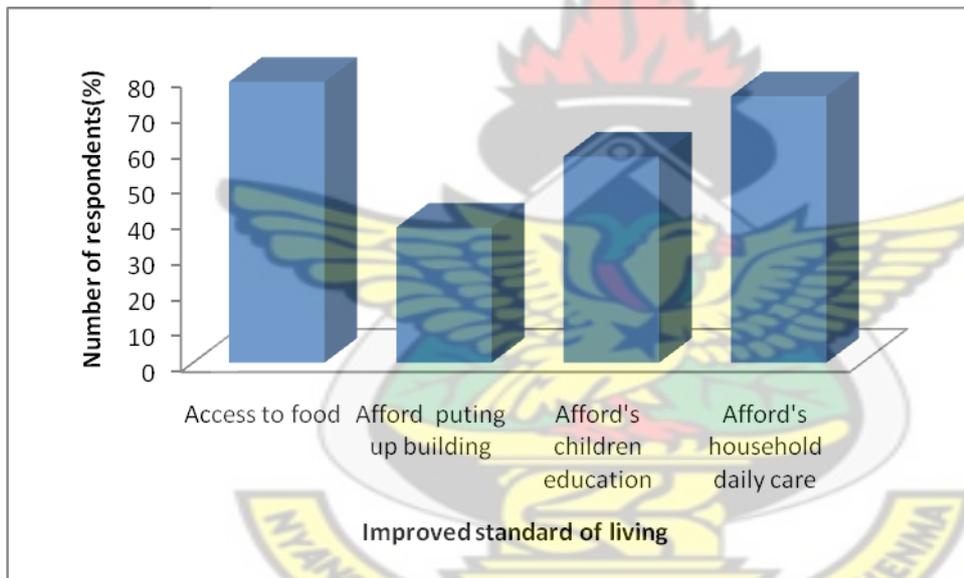


Figure 4.17 The impact of the Modified Taungya System on the standard of living in households in the studied area. (n=288)

Source: Field Survey,2005

4.7 AFFORESTATION USING THE MTS

Total target for afforestation over the period (2001-2004) was 16050ha but a total of 18344.40 ha was achieved, (12.5% above the target). This is mostly attributed to the benefit sharing agreement which according to Agyemang *et al.* (2003), is to motivate farmers to take care of the planted seedlings and to remain on the allocated plot after canopy closure.

From Table 4.13 every year, the planting target given is exceeded and this is due to the fact the applicants to the MTS far exceed the area allocated to a given community i.e. demand for land exceeding supply. There is an overwhelming demand for the relatively fertile forest land compared to the areas outside the forest reserve, but due to resource constraints only a limited acreage is given to the farmers for easy management and to avoid the situation which led to the suspension of the Taungya system in the 80's as stated by Agyemang (2003).

The National Forest Plantation Development Programme was designed to expand plantation cover from 20,000 ha to 60,000 ha by the end of 2008. Lands targeted for reforestation was 40,000 ha of timber by the end of 2008. In 2002 alone, 28,400 ha of timber were planted, while 30,326 ha were planted in 2003. This represents a cumulative figure of 58,726 ha by the end of 2004 indicating an excess over the target of 40,000 ha to be achieved by 2008. About 88,000 jobs were also generated by 2004 while the rate of deforestation over the period reduced GPRS I, (2005), and (FC Annual Report (2004)

Table 4.13 below presents the annual area planted from 2002 -2005in the studied area

Table 4.13 Annual planting target and the achievement in the sub-humid forest zone in Ghana from the year 2002 to 2005.

Year	Target(ha)	Achievement(ha)
2002	3500	4033
2003	4200	5,441.8
2004	4350	4737
2005	4000	4132.60
Total	16050	18344.40

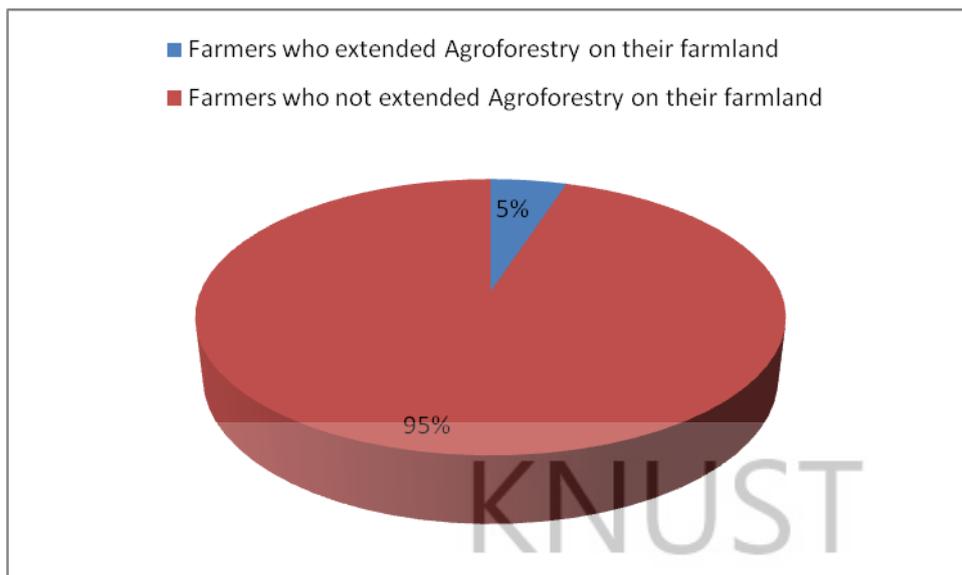
Source: FSD, 2005

4.8 ADOPTION OF AGROFORESTRY PRACTICE BY FARMERS

Though farmers were to extend MTS to their own land outside the reserve, only a handful (5%) did that (Fig. 4.18).

The rest wished they could extend the practice on their land but they do not have the right to plant trees on the land because they do not own the land. According to Fobih (2004) only landlords can plant trees on the land. According to Shepherd (1990) the rights over land do not always confer rights to the trees that grow on it and vice versa and where there is uncertainty over rights and ownership of trees little planting is done.

The 95% farmers who have extended Agroforestry on their farms were of the view that even if they plant the trees, it belongs to the government and they will not get any financial benefit from it. All the respondents operated farms outside the reserve but only 5% were operating the MTS on their farm outside the reserve.



Source: field survey,2005

Figure 4.18 Percentage of farmers who have extended the principle of agroforestry on their privately owned land in the studied area.

4.9 PLANTING SITE PRODUCTIVITY

The study period was first rotation since the commencement of the Programme, there was not much change in terms of physical properties of the soil and there was no soil chemical analysis at the commencement to compare with the present status.

Because of the relatively high fertile soil in the reserve, most of the farmers do not use fertilizer (Lamb, 1967). Some farmers prepared mounds and planted their crops in it; and reported improvements in crop yield. This can be attributed to the fact that the formation of the mounds, which generally involves the heaping of topsoil, might have concentrated nutrients in the soil and enhanced soil aeration leading to improvement in crop yield Lamb (1967). There was no indication of how bad or good the planted tree has affected the productivity of the site.

4.10 LAND ALLOCATION AND EASE OF ACCESS TO THE SITE

All the respondents operated farmland outside the forest reserve to supplement income from the Modified Taungya System. The farmers were allocated land by FSD free of charge in the reserve, and were required to follow specific rules. In particular farmers were not permitted to

- exploit timber or other forest products,
- set the forest on fire,
- neglect the tree component (in favour of their crops), or
- destroy or damage the trees.

Land availability was not a limitation as anyone who applies to participate in the project is allotted a parcel of land to farm. However, it was observed that the size of the land allotted was too small (about an acre). According to Mustajab *et al* (1997) it is not enough for sustainable income activity. Thus, the realisation of the NFPDP objective of reducing poverty through land reforms and income redistribution has confirmed Webster's (1990) strategy of addressing poverty in the Third World countries. This is also in agreement with SRID (2001), which states that about 60% of all farms in the country are less than 1.2ha, 25% are between 1.2 to 2.0ha with a mere 15% above 2.0ha, and the mean farm size is less than 1.6ha. A situation which has given rise to extortion by some FSD officials and the Taungya Committee members before you are given a larger parcel of land to farm. A limitation to land availability will be when there is no degraded reserve in a community or due to supervisory limitations the FSD decide not to undertake plantation in a community. It was also found that the desire to farm on forestland is not necessarily caused by a shortage of agricultural land but rather the inherent fertility of the forest land Lamb (1967).

Women made up about 39% (Fig.1) of the respondents indicating women are not discriminated against in the land allocation and are allowed to own a parcel of land to

farming. This is in accordance with Krantz (2001) who stated that improving woman's access and participation is an important, indeed integral part of the process of achieving sustainable livelihoods

There was Taungya Committee in all the study areas headed by representatives from the FSD, who act as intermediary between the farmers and the FSD. The establishments of these committees have given the community a voice and an arena of discussion and to ensure the compliance of all actors involved in the MTS scheme. Community members are elected to form their committees. The committees does the allocation of the degraded lands to farmers and also monitor's farmers' and FSD's performance as well as settle disputes, and can implement sanctions if necessary (Agyeman *et al.*2003). Though each farmer was allocated about an acre of land each year, but the leaders of the Modified Taungya Committee in all the communities were given more land than ordinary MTS participant. According to Krantz (2001), the informal structures of social dominance and power within communities influence people's access to resources and livelihood opportunities.

There were no road or poorly maintained road networks from the farming villages to the farms. In some instances skid trails used in harvesting timber was the only access route. Farmers especially the females have to walk long distance before reaching the farms as some men have bicycle on which they travel.

4.11 ENVIRONMENTAL IMPACTS

Most of the trees planted are exotic monoculture either being teak or *cedrela* and few indigenous species. The tree planting has led to increase forest cover which will improve the

habitat of birds and other animals, ensure drought and flood control and enhance climate stability.

KNUST



CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

Ghana in 2001, introduced the MTS for improving Livelihoods of forest fringe communities, restore forest cover and address timber deficit.

Through a mix of qualitative and quantitative methods, field observations and a household surveys, A total of 280 respondents comprising 150 farmers who are participating in the MTS and 100 who are not participating in the MTS and 30 other stakeholders including forestry officials, chiefs and opinion leaders were interviewed in the sub-humid forest zone in Ghana were interviewed to assess the impact of the MTS on their Livelihood.

The impact of the Modified Taungya System can only be made with regard to the contribution the crops harvested from MTS made to local people's livelihoods since the timber component of the scheme has not yet been harvested.

The results show that MTS farmers made gains in the following areas:

food sufficiency as 69% reported they are able to meet family food need for at least ten months a year,

income generation as 52% reported they have more than one source of income,

Employment, about 900 jobs have been offered in the study area

livelihood assets, 67% reported they able to afford basic household assets.

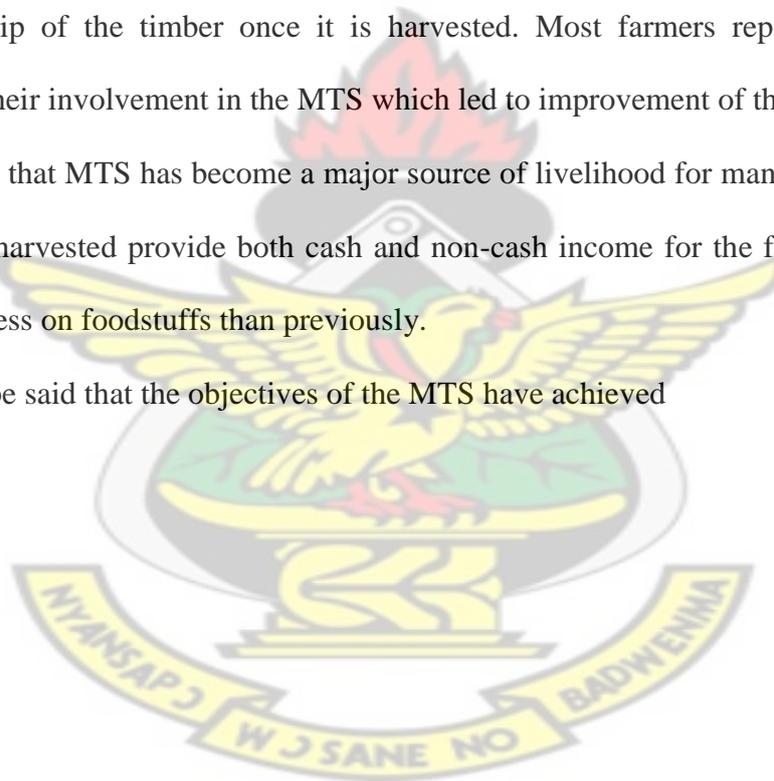
These gains reduced poverty considerably as compared with non-MTS farmers. According to Basic Needs Strategy and Relative Deprivation poverty, the increased income and food crops are indices for measuring poverty reduction. These indices show an achievement of poverty reduction targets in the communities. The increase in farm lands to farmers according to Webster's (1990)-is one of the solutions to reducing rural poverty

Reforestation is the primary objective of the National Forest Plantation Development Programme (NFPDP) and there is a significant progress in tree cover in the surveyed communities.

The benefit-sharing arrangement and rights granted to farmers represents a significant amelioration of tenure rights. Tree tenure in Ghana was complicated and ambiguous, since growing trees in Ghana does not necessarily means ownership of the planted tree. The MTS offers access to land and rights to extract the agricultural products grown on the land as well as part ownership of the timber once it is harvested. Most farmers reported significant changes due to their involvement in the MTS which led to improvement of their livelihoods.

The study shows that MTS has become a major source of livelihood for many of the farmers. The food crops harvested provide both cash and non-cash income for the farmers, meaning that they spend less on foodstuffs than previously.

It can therefore be said that the objectives of the MTS have achieved



5.2 RECOMMENDATION

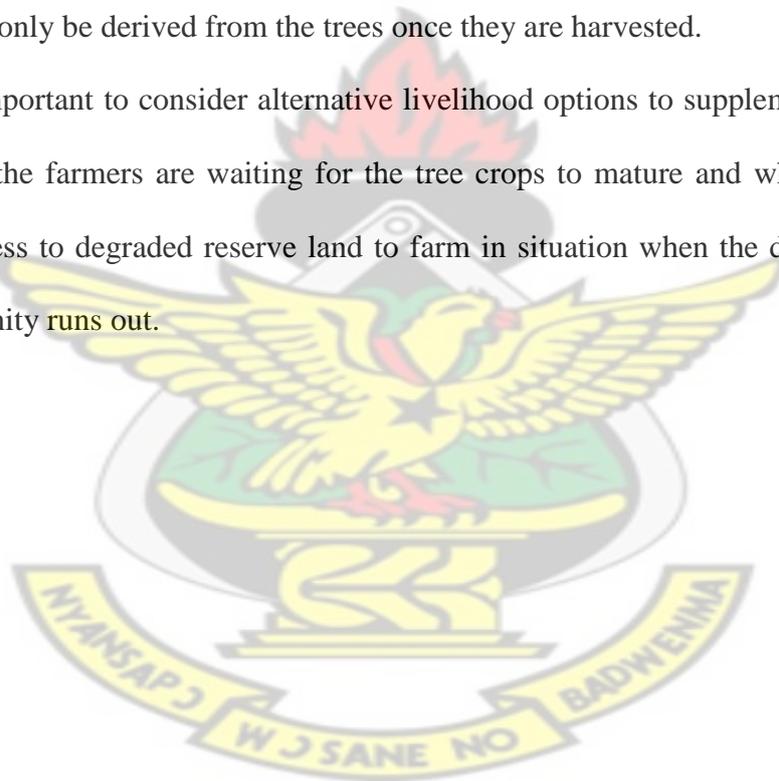
The continuous over reliance on MTS as a livelihood by farmers is not sustainable in three ways:

Firstly when the MTS farmers can no longer grow the agricultural crops (*i.e.* when the trees canopies close and they cast shade),

Secondly when the quantity of degraded reserve runs out the forest-adjacent communities can not create a livelihood.

The tree crops grown under the MTS do not contribute to people's livelihoods immediately; and income will only be derived from the trees once they are harvested.

It is therefore important to consider alternative livelihood options to supplement the MTS in the years when the farmers are waiting for the tree crops to mature and when they can no longer have access to degraded reserve land to farm in situation when the degraded reserve near the community runs out.



REFERENCES

- Abu, A., (1996). Social and Environmental consideration in forestation in Ghana. A paper presented at a workshop on Forest Plantation in Ghana- Akyawkrom Ashanti (27th - 29th February 1996)
- Acheampong E., Marfo, E., and Opuni-Frimpong, (2012).Fractured Tenure, Unaccountable authority, and Benefit Capture: Constraints to Improving Community Benefits under Climate Change Mitigation Schemes in Ghana.
- Adam G., Rodney J. K., Peter K., Richard S, (2006). IUCN/WWF Forest Conservation Newsletter.
- Adjei P., Osei-Wusu PhD and Eshun G., PhD. (2009). Forest Reclamation REDD Readiness and Community Livelihood Sustainability:Assessing the viability of the Modified Taungya System As a Decentralised Nature Governance Strategy
- Agyemang, V.K., Asare, A.B., Agyemang, F.,Danso, E., Kasanga, K.R.,Marfo, K.A., Yeboah, O.M.(2003). *Revising the taungya plantation system: new revenue-sharing proposals from Ghana*, Unasyuva 212, Vol. 54, 2003.
- Agyemang, O.A., (2001). Plantation Development in Ghana. A paper presented to students on attachment at the Resource Management Support Centre. Forestry Commission Unpublished.
- Agyemang, V.K., (1993). Land, tree and forest tenure systems: implications for forestry development in Ghana. African Development Foundation. 36 pp.
- Agyemang, V.K. and Brookman-Amissah, (1987). Agroforestry as a sustainable agricultural practice in Ghana.

- Agbede, O.O., and Ojo, G.O.A., (1981). Food crop yield under *Gmelina* plantations in southern Nigeria (Forestry Research Inst. of Nigeria, Ibadan)
- Agbeja, B. O. (2004). *Valuation of investment on teak plantation on a 15-year rotation for intending small-holders in Nigeria*. Nairobi: United Nations.
- Ahenkan, A., Baduon, B., N., Boon, E., (2008). An Assessment of Resources Policy and Management in Ghana
- Anne M., T., (2000). Sustainable Livelihoods Approaches at the Policy Level Paper prepared for FAO e-conference and Forum on Operationalising Participatory Ways of Applying a Sustainable Livelihoods Approach.
- Appiah, M., (2001). "Co-partnership in forest management: The Gwira-Banso Joint Forest Management Project in Ghana". *Environment Development and Sustainability*, 3(4), 343–360
- Appiah, S. K., (1996). *Investment Policy in the forestry sector and its implication for Plantation Development (Workshop on forest plantation Development in Ghana)*
- Ardayfio-Schandorf, E., (2007). "Gender Mainstreaming In Forestry in Africa": Ghana. Food and Agriculture Organization of the United Nations, Rome, 2007, pp. 1-33.
- Ardayfio-Schandorf, E., Ngono, D. L., Colfer, C., and Cyrie, S., (2007). "Gender and the Forestry Situation in Africa: The Way Forward." Presented at the IUFRO Division VI Symposium: Integrative Science for Integrative Management 14-20 August 2007, Saariselkä, Finland
- Arnold, M., & Townson, I., (1998). Assessing the potential of forest product activities to contribute to rural incomes in Africa. Overseas Development Institute. London
- Assabil, J. K., (1996). The effect of spacing on early Growth Performance of Teak (*Tectona grandis*) Seedling on Transplant Bed Bsc. Thesis- IRNR –KNUST (Unpublished).

- Asiamah R. D., (2003). Assessment of soil nutrient balance approaches and methodologies
- Baah- Wiredu, (2006). Implementation of tax policies and administrative Measures based on the budget statement and economic policies of government for 2001-2006
- Baffoe, K.A., Boakye, K.A., (2006). Trends in forest ownership, forest resources tenure and institutional arrangements: Case study from Ghana. Prepared for the regional workshop on Trends in Forest Ownership, Forest Resource Tenure and Institutional Arrangements in Africa, held in Nakuru, Kenya from 19 to 21 October 2006.
- Baldus, R., Kibonde, B., Siege L., (2003). Seeking Conservation Partnership in the Selous Game Reserve, Tanzania. *Parks* 13(1):50–61.
- Banarjee, A., Campbell, G., Cruze, C., Davis, Sh. H., Augusta, M., (1997). Participation in Forest Management and Conservation. World Bank: Social Development Department Papers Participation Series, p 38.
- Barrows, E. M. and Fabricius, C., (2002). Do Local People Really Benefit from Areas: Rhetoric or Reality? *Parks* 12:67–79.
- Bebbington, A., (1999). Capitals and Capabilities: a Framework for Analyzing Peasant Viability, Rural Livelihoods and Poverty, *World Development*, vol. 27 (12): pp. 2021-2044
- Behera, B., and Engel, S., (2005). Who Forms Local Institutions? Levels of Household Participation in India's Joint Forest Management Program, *ZEF – Discussion Papers on Development Policy* No. 103, Center for Development Research, Bonn, pp. 1-37
- Black, A., Campell, C., Tont, M., (2001). RIRDC Publication number 01/45, RIRDC project number ECU-8A

- Birikorang, G., (2001). Wood Industry and Log Export Ban Study. Consultancy Report for the Ministry of Lands and Forestry, Ghana
- Blay,D.,Appiah,M.,Damnyag, L.,Dwomoh,F.,Luukanen,O.,Pappinen, A.,(2008). Involving local farmers in rehabilitation of degraded tropical forest :Some lessons from Ghana.*Environ, Develp.Sustain.* 10,503-518.
- Bonner, R., (1993), *At the Hand of Man: Peril and Hope for Africa's Wildlife*, Alfred A. Knopf, New York, pp 322.
- Bradshaw, M., Wood, L. and Williamson, S., (2001). Applying qualitative and quantitative research: A social impact assessment of fishery. *Applied Geography* (21): 69-85
- Brookman-Amissah, J., (1978).Agrisilviculture for wood and food crops in Ghana. In proceedings of the 8th World Forestry Congress, vol.3, pp597-606
- Brown, K., (2003). Three Challenges for Real People-Centered Conservation. *Global Ecology and Biogeography*, 12(2): 89–96.
- Brown, K., (2002). Innovations for Conservation and Development. *The Geographical Journal*; 168: 6–17
- Bryman, A., (2001). *Social Research Methods*. Oxford University Press, UK. 540 p.
- Carvalho, S. and White, H., (1997). Combining the qualitative and quantitative approaches to poverty measurement and analysis. The practice and potential. World Bank Technical Paper No.366. Washington DC
- Central Intelligence Agency,(2012). *The World Fact book Ghana*. Available: <https://www.cia.gov/library/publications/the-world-factbook/geos/gh.html>
- Chambers, R., (1983). *Rural development. Putting the last first*. London: Longman Group UK Limited

- Chambers, R and Conway, G., (1992). Sustainable rural livelihoods: practical concepts for the 21st century. IDS Discussion Paper No. 296. Brighton, IDS, p. 7 -8
- Chavangi and Raintree, (1987). Ecological benefits of intercropping edible fungi with mulberry in fields. *Zhongguo-Shiyongjun, Edible fungi of China* 2: 34-35.
- Cohen, J., (1988). Statistical Power for Analysis for the Behavioral Sciences. Hillsdale, N.J.: Lawrence Erlbaum Associates
- Crabtree, B. F. and Miller, W. L. (1992). Primary care research: A multi-method typology and qualitative road map. *Doing qualitative research: Research methods for primary care*. Vol. 3. Sage Publications. Newbury Park, London and New Delhi
- David Appiagyei, (2004). Forestry Commission, Personal Conversation
- D. Carney, (1998). Implementing the Sustainable Rural Livelihoods Approach. Sustainable Rural Livelihoods: What contribution can we make? London, DFID: 3-23
- Donkor, K. (1997). *Structural adjustment and mass poverty in Ghana. The making of modern Africa*. England: Ashgate Publishing.
- Dubois, O., (2003). Forest-based poverty reduction in less developed countries: some facts, figures, challenges and possible ways forward, Forestry Policy and Institutions Branch, FAO, 0315-A2, Rome
- DFID, (1999). Sustainable Livelihoods Guidance Sheets
- Enabor, E. E., Okojie J, A., and Verinumbe, I, (1995). Department of forest Resource Management, University of Ibadan and International Institute of Tropical Agriculture, Ibadan Nigeria
- Enabor, E. E., Okojie, J. A. and Verinumbe, I. (19982). Taungya System: Socio-economic

- Prospects and Limitations. In Macdonald, L. H. (ed) Proceedings of the Workshop on Agroforestry in the Humid Tropics. The United Nations University, Tokyo, Japan, 59-64.
- Enabor, E.E., (1979). 'Economic aspects of taungya as a tool for rural development: Then case for increased investment in forestry', Nigeria Journal of Forestry, 8(1&2): 27-34.
- European Union (EU) (2006).Country Environmental Profile of Ghana. *Final Report*. Framework contract Europe Aid 119860/C/SV/Multi-Lot No.6 Environment.
- Evans, J., (1992). Plantation forestry in the tropics: tree planting for industrial, social, environmental and agroforestry purpose (2nd ed., 403). Oxford: Clarendon Press
- Fobih, D., (2004). Lands in Africa: Market Asset, or Secure Livelihood? Church house, Westminster London November 8-9 2004.
- Food and Agriculture Organization, 2010: Global Forest Resources Assessment, 2010. Country Report, Ghana. Available: <http://www.fao.org/docrep/013/al513E/al513E.pdf>
- Food and Agriculture Organization, (2003). State of the World's Forests Review. Food and Agriculture Organization of the United Nations
- Food and Agriculture Organization, (2001). State of the world's forests 2001.
- Food and Agriculture Organization, (2000). Global forest resources assessment main report. FAO Forestry Paper 140: 479.
- Food and Agriculture Organisation (FAO), (1993). FAO forestry Paper
- FAO, 1984. The taungya system in south-west Ghana In: FAO Soils Bulletin No.53, FAO, Rome, pp. 183–185
- Food and Agriculture Organization, (1982). Tropical Forest Resources. FAO, Rome, Italy.

Food and Agriculture Organization, (1967). *Taungya System in Kenya, The Shamba system*. Proceedings of the symposium on man-made forest and their industrial importance pp1057-68, FAO Rome.

Forestry Commission, (2007). *Validation of Legal Timber Programme Paper No. 3*.

Forestry Commission, (2005). *Benefit sharing agreement for the modified taungya forest plantation*. Ministry of Lands, Forestry and Mines. Accra, Ghana.

Forestry Commission, (2004). *Progress report on the National Forest Plantation Development Programme. Annual report, 2003-2004*. Accra.

Forestry Outlook Study for Africa (FOSA) 2003: Corporate Document Repository: Country Report-Ghana.

FOSA Country Report (2002) –Ghana available at www.fao.org/docrep/003/ab567e02ht

Forest Services Division, (2005). *Document on achievement of NFPDP*. unpublished.

Forest Services Division 2004. *Documents on achievement of NFPDP* . Unpublished

Forest Services Division 2003. *Documents on achievement of NFPDP* . Unpublished

FSD Annual Reports – 1962-94. Unpublished.

Gasana, J. K., (2002). *Women and Tropical Forest Development Programme in Ghana*.

Ghana Forest Investment Program Forest Investment Program (FIP) Plan- 19 April 2012

Ghana Forestry Commission , (FC) (2009). *PAFORM APPROACH: Sharing the Gains of the Participatory Forest Resource Management Project in the Transitional Zone*, p. 2.

Ghana Districts Profile www.ghanadistricts.com 14/10/2010, 15:35 GMT

Gordon, A. M. and Newman, S. M., (1998) *Tree Physiology, Temperate agroforestry systems*. CAB INTERNATIONAL (ed), Wallingford, Oxon OX10 8DE, U.K. 270 p.

Gordon, A. M., Newman, S. M. (eds), (1997). *Temperate Agroforestry Systems*. CAB International, Wallingford, UK, 269 pp.

- Ghana Poverty Reduction Strategy I, (2005). *2004 annual progress reports*. Accra: National Development Planning Commission.
- Ghana Living Standards Survey Report of the Fifth Round (GLSS 5) *Ghana Statistical Service September 2008*.
- Ghana Living Standards Survey 1, (1989). *Ghana living standards survey report of the first Round (GLSS 1)*. Accra: Ghana Statistical Service.
- Hackel, J. D., (1999). Community Conservation and the Future of Africa's Wildlife. *ConservBiol* 13(4):726–734.
- Hawthorn, W.D., (1994). Fire Damage and forest Regeneration in Ghana
- Hawthorn, W.D., & Abu Juam, M., 1995: Forest production in Ghana. Forest Conservation Series no. 14, IUCN, Gland.
- Hiremath B.N., Raju, K.V., (2004). Livelihood Security: A Prerequisite for Sustainable Natural Resource Management ON Srivastava (ed.) (2004) *Management of Natural Resources for Sustainable Livelihoods and Poverty Alleviation, Volume I 1* Hyderabad: National Institute of Rural Development, pp 95-111.
- Ijalana (1979) in E.E. Enabor, J.A. Okojie, and I. Verinumbe Taungya systems: Socio-economic prospects and limitations. Department of Forest Resources Management, University of Ibadan, and International Institute of Tropical Agriculture, Ibadan, Nigeria
- Indufor, (2010). Background to forest financing in Low Forest Cover Countries (LFCCs) First macro-level paper.

- Jennie L., (2009). Consequences of the introduction of the Modified Taungya System in Ghana's high Forest Zone for the livelihoods of forest-fringe communities (MSc. Thesis)
- Johanson, R.K. and Adams ,A.V., (2004). Skills Development in Sub-Saharan Africa. World Bank Regional and Sectoral Studies. World Bank, Washington, USA.
- Kartasubrata, J. and Sulhardjito,D., (1995). Social forestry programme in java IPB and the foundation , Bangor.
- Karen Ann Dvorak, (1992). Technical Paper 6: Socio-Economic Data Collection Methods*
- Kalame, F., (2009). The Modified Taungya System in Ghana's transitional zone. Forests and Climate Change: adaption and mitigation, November 2009. ETFRN. pp101-106.
- Kideghesho, J. R., Røskaft, E., Kaltenborn, Bjørn P. (2006). Factors Influencing Conservation Attitudes of Local People in Western Serengeti, Tanzania. *Biodivers Conserv* (2007) 16:2213–2230 DOI 10.1007/s10531-006-9132-8.
- King, K. F. S., (1968). Agrisilviculture (the Taungya System). Bulletin No.1 IbadanUniversity Press, Ibadan, Nigeria
- Kio, R. P., (1972). Shifting Cultivation and Multiple Use of Forestland in Nigeria. *Com. For. Rev.* 51: 144-148.
- Koroma, A., P., (1996). Taungya in Sierra Leone Forestry Division, Ministry of Agriculture and forestry, Freetown, Sierra Leone.
- Kotey E. N. A., Francois J., Owusu J. G. K., Yeboah R., Amanor K. S., and Antwi, L., (1998). Falling into place. Ghana policy that works for forests and people series no 4, IIED, London, UK.
- Krantz, L., (2001). The sustainable livelihoods approach to poverty reduction. SIDA
- Lambert O., (1999). The Bane of Sustainable Forest Management in Africa: The Case of Ghana.*

- Lamb, A.F.A., (1967).Artificial regeneration within the humid lowland tropical forest. Department of Forestry at the Commonwealth Forestry Institute, Oxford, England, prepared this paper for the first session of the FAO Committee on Forestry Development in the Tropics, held at Rome 18-20 October 1967
- Lowe, R. G. (1987). Development of Tuangya in Nigeria. In Gholz (ed) Agroforestry: Realities,Possibilities and Potentials. Martinua Nijhoff, Dordrecht, 137-154
- Madeez Adamu-Issah, Elden,L., Forson M., Schrofer T.,(2007). Achieving Universal Primary Education in Ghana by 2015: A Reality or a Dream? UNICEF Working Papers.
- Marfo, E., (2009). Security of Tenure and Community Benefits under collaborative forest management arrangements in Ghana: A Country Report. CSIR-INSTI: Accra
- Marfo, E. (2006). Powerful Relations.The role of actor-empowerment in the management of natural resources conflicts. A case of forest conflicts in Ghana.Ph.D Thesis. Wageningen University, Wageningen,the Netherlands
- Marfo, E., (2001).Community Interest Representation in Negotiation: A Case of the Social Responsibility Agreement in Ghana. (MSc. Thesis).
- Marfo, K., Anchirinah, V., Wiggins, S., (2002). Environmental policies and livelihoods in the forest margins of Southern Ghana. CSIR, Ghana (Ministry of Lands and Natural Resources. Natural Resources and Environmental Governance Programme (Technical Paper). Terms of reference for preparation of forest management plans. Available at www.fcghana.org

- Michael Drinkwater and Tamara Rusinow, (1999). In Search of Sustainable Livelihood Managing Resources and Change
- Milton, R., (1994). Some issues and observations arising from district Taungya studies. For use in discussion for development of FP4 – Forest reserve rehabilitation. Forestry Commission Memo, Accra.
- Ministry of Environment and Science (MES). , (2002). National Biodiversity Strategy for the Republic Ghana, Government of Ghana, Accra.
- Ministry of Lands and Forestry (MLF), (1996). Forestry development master plan (26) Accra, Ghana
- Ministry of Lands and Forestry, (1994). *Ghana Forest and Wildlife Policy of the Republic of Ghana*. Accra, Ghana
- Nadjombe, O., (1981). Taungya practices in Togo Directeur General de l'Office de Developpement et d'Exploitation des Forests (ODEF), Lome, Togo
- Nao,(1978). in E.E. Enabor, J.A. Okojie, and I. Verinumbe Taungya systems: Socio-economic prospects and limitations.Department of Forest Resources Management, University of Ibadan, and International Institute of Tropical Agriculture, Ibadan, Nigeria.
- NEPAD, (2002). Comprehensive Africa Agriculture Development Programme. New Partnership for Africa's Development (NEPAD), Midrand, South Africa.
- Okurume, Godwin E.,(1970). The impact of agricultural export expansion on domestic food supplies in Western Nigeria

- Opoku, K., (2006). *Forest Governance in Ghana: An NGO Perspective*. A report produced for FERN by Forest Watch Ghana, March 2006. www.fern.org. FERN: Brussels.
- Owusu, A. K., (2002). Assessment of modified taungya system in Sunyani forest district. A case study of the Tain II forest reserve. Diploma Dissertation. CRNR, Sunyani. (Unpublished)
- Poffenberger, M., (1990). *Keepers of the Forest, Land Management Alternatives in Southeast Asia*. Kumaria Press, West Hartford, U.S.A, p. 289.
- Rakodi, C., (2002). A Livelihoods Approach - Conceptual Issues and Definitions, in: C. Rakodi and T.Lloyd-Jones, *Urban Livelihoods, a People-centred Approach to Reducing Poverty*, Earthscan, London, pp 3-22
- Rao, M. R., Nair P. K. R. and C. K. Ong, (1997). Biophysical interactions in Tropical agroforestry systems. Volume 38, Numbers 1-3.
- Redwood, M.(ed) (2009). *Agriculture in urban Planning , Generating Livelihoods and Food Security*. Earthscan, London.
- Ribot, J. ,(1999). Decentralisation and participation and accountability in Sahelian forest. *Legal instruments of political administrative control*. Africa, 69(1): 24-57
- Ros-Tonen, M.A.F., Zaal, F., Dietz, T., (2005). *African Forests between Nature and Livelihood Resources: Interdisciplinary Studies in Conservation and Forest Management*. Lewiston NY: The Edwin Mellen Press. 3-29.
- Ros-Tonen, M.A.F and Wiersum, K.F., (2005). The scope of improving Rural Livelihoods through Non-Timber Forest Products: An evolving Research Agenda, *Forest, Trees and Livelihoods*. 15(2):129-148.

- Sackey, A. N. A., (2007). Assessment of Forest Management Practices in Ghana: A Case Study of Some Forest Districts in Ghana (Abstract). *The IMRE Journal* Volume 1(2), 2007.
- Stacey R, Birgit M, Shahla S, D'Souza A, and Rada N, (2012). International Food Security Assessment, 2012-22 GFA-23, USDA, Economic Research Service.
- Segestrom, G., (1976). Creating Work and caring about Workers in Tropical Countries. *Unasylva* 114: 2-9.
- Shackleton, S.E., Campbell, B., Lotz-Sisitka, H. Shackleton, C., (2008). Links between the Local Trade and Natural Products, Livelihoods and Poverty Alleviation in a Semi-arid Region of South Africa, *World Development*, Volume 36(3), p 505-526.
- Sheperd ,R.K. (1986/90). Plantation Silviculture. Martinus Nijhoff Publishers 322pp
- Siaw, D. E. K. A. (2001). State of genetic resources in Ghana, Forest genetic resources Working papers (FGR/17E). Forest Resources Division, FAO, Rome Italy
- Steve Harrison Socio-economic Research Techniques in Tropical Forestry Proceedings of an International Training Workshop held in the College of Forestry at Leyte State University, Visca, Baybay, The Philippines, over the period 4-10 February, 2002
- Stoney, C. and Bratamihardja, (1990). Identifying appropriate Agroforestry Technologies in Java. In Poffenberger, M. (Eds). *Keepers of the forest*. Kumarian press.
- Sunderlin, W.D., Angleson, A., Belcher, B., Burgers, B., Nas, R., Santos, L., Wunder, S. (2005). Livelihood, Forest, and Conservation in Developing Countries: An overview. *World Development* 33(9) pp.1383-1402.
- Sunderlin, W.D., Angleson, A., Wunder, S., (2003). Forests and Poverty Alleviation. Center for International Forestry Research. *Development Southern Africa*, Volume 18, Issue 5 December 2001, pages 581 – 604.

- Statistics, Research and Information Directorate (SRID)., (2001). *Agriculture in Ghana. Facts and figures*. Ministry of Food and Agriculture. Accra. Ghana
- Treue, T., (2001). Politics and economics of Tropical High Forest Management: a case study of Ghana. Dordrecht, Springer, pp. 1-50.
- The IUCN/WWF Forest Conservation Newsletter September 2006
- Thevathasan, N. V. and M. Gordon, (1997). Poplar leaf biomass distribution and nitrogen dynamics in a poplar-barley intercropped system in southern Ontario, Canada. *Agroforestry Systems* 37: 79–90. Volume 37, Number 1.
- Tropenbos-Ghana, (2005). Reconciling Policy Reforms with Forest Legislation; Tropenbos International-Ghana, 2005.
- United Nations Framework Convention on Climate Change UNFCCC, (2007). "Investment and financial flows to address climate change". unfccc.int. UNFCCC. p. 81.
- Wagner, M. R., Cobbinah, Bosu, and P.P., (2008). Forest Entomology in West Tropical Africa: forest insects of Ghana. Dordrecht, Springer.
- Watson, G. A., (1983). Development of Mixed Tree and Food Crop Systems in the Humid Tropics: A response to Population Pressure and Deforestation. *Experimental Agriculture* 19: 311-332.
- Webster, A., (1990). *An introduction to sociology of development*. (2nd ed.), London: Palgrave Macmillan
- Western, D., (2001). Taking a Broad View: A Response to Adams and Hulme. *Oryx* 35:201–203
- 2032230 Biodiversity Conservation (2007) 16:2213–2230.
- White A. M., Martin, A., (2002). Who Owns World's Forests? Forest Tenure and Public Forests in Transition, 2002. Forests Trends and Center for International Environmental Law, Washington D.C., p. 30

White, H., (2002). Combining qualitative and quantitative approaches in poverty analysis.
World Development (30): 511-22

Wiersum, K, F., (1984). Tree Gardening and Taungya on Java: Examples of agroforestry
Techniques in the humid tropics; agroforestry system.1:53-70.

World Bank, (2006). Strengthening Forest Law Enforcement and Governance: Strengthening
a Systemic Constraint to Sustainable Development. Report No. 36638-GLB.
Washington, DC: The World Bank.

World Bank, (2002). A revised Forest Strategy for the World Bank Group. Washington DC:
World Bank.

World Rainforest Movement bulletin N° 61, August 2002.. Community Forest Management:
A feasible and necessary alternative

Webster, A. (1990). *An introduction to sociology of development*. (2nd ed.), London:
Palgrave Macmillan.

www.peopleandplanet.net . Accessed on 23-09-2012 at 12:39pm

www.nssd.net/pdf/sectiont.pdf .Accessed on 23-09-2012 at 12:45pm

www.modernghana.com .Accessed on 23-09-2012 at 2:08pm

www.fern.org/sites/fern.org/files/media/documents/document_3643_3644.pdf last accessed
on 14-2-2013

http://en.wikipedia.org/wiki/Women_and_agriculture_in_Sub-Saharan_Africa

www.mongabay.com last accessed on 24-03-2013 at 13:45pm

www.profor.info/profo/node/60

Yin, R. K., (1984). Case study research: Design and methods, 2nd Edition. Sage Publications, Inc., California

Referenced Ghanaian laws and Document

Forest and Wildlife Policy, 1994. Republic of Ghana, Accra

Forest Plantation Development Fund (Amendment) Act 2002. Republic of Ghana, Accra

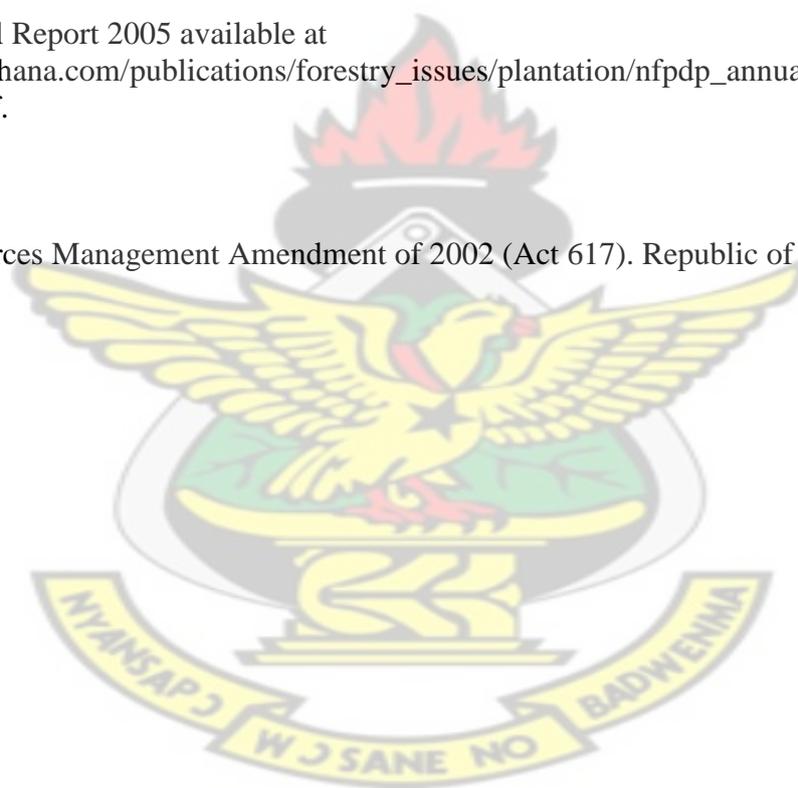
NFPDP Annual Report 2003 available at

http://www.fcghana.com/publications/forestry_issues/plantation/nfpdp_annual%20report_2003.pdf.

NFPDP Annual Report 2005 available at

http://www.fcghana.com/publications/forestry_issues/plantation/nfpdp_annual%20report_2005.pdf.

Timber Resources Management Amendment of 2002 (Act 617). Republic of Ghana, Accra



APPENDIX A

Sample of the Profor Table

	1	2	3	4	5	6	7	8	9	10	
Natural Forest Products											
PESTLE	1										
TIMBER											
FIREWOOD/CANE		2									
CHEWING STICK											
WRAPPING LEAVES				4							
SIBRE					5		2				
FRUITS											
GAME				6							
TOTAL											20
Products from MTS											
PLANTAIN		10	5			32	25	5	5		
COCOYAM		2	6		13		5				
VEGETABLES				11		6		9			
YAM			9	5	10	12					
MAIZE				5	12	3	20	6			
TOTAL											216
Sole Agric											
MAIZE	4		7								

COCOA								11	20		
VETABLES					7	5	8				
FRUITS				5	5	1					
YAM		6									
PLANTAIN		6			10		10				
CASSAVA	6	9				11	9				
COCOYAM					4			4			
TOTAL											148
Fallowlands											
CASSAVA	1										
COCOYAM											
PLANTAIN											
OIL PALM		6									
MUSHROOM	2		3								
SNAIL											
TOTAL											12
PETTY TRADING								2			
REMITTANCES					2						
TOTAL											4
GRAND TOTAL	14	41	30	36	68	70	79	37	25		400

APPENDIX B

QUESTIONNAIRE FOR MTS PARTICIPANT

1. Gender: _____ Age: _____
2. Education Level: Primary: _____ JHS: _____ SHS : _____ Voc: _____ Tertiary : _____ Nonformal : _____
None
3. What is the size of your Household?
4. What are the Sources of your Income: Farming: _____ Collection of NTFPS: Petty trading: _____
Reforestation *e.g.* MTS, HIPIC: Others _____
5. Why did you get involved in MTS?
Land/Livelihood/ Food Crops/ Preserve Environment/ Other _____
6. What is the size of the farm?
7. What crops are you allowed to plant in the MTS?
8. What crops would you plant if you had the choice and why?
9. Do you consider MTS as a livelihood?
Why yes/no?
10. What was your main livelihood before MTS?
11. Would you consider the MTS as a reliable source of income or as a subsistence source of income? Why?
12. Have you seen any improvement in the indicators of standard of living (livelihoods) below since joining the MTS?
Income: Crops: Food: Shelter: Access to Trees: _____
13. What benefits do you gain from MTS?
Employment/land for farming/food/firewood/income from food crops/ long term income from tree

15. What are your responsibilities as a farmer in the MTS scheme?
16. Do you agree with the benefit sharing arrangements within the MTS that you're involved with?
17. What are the threats to the success of the MTS scheme?
18. What problems do you have with MTS?
19. Do you have intentions to extend tree planting in the future to a land outside the forest reserve? Ans. Yes / No. Give reasons.
20. How you compare food crop yield on MTS farm and non-MTS farm?

High Low

MTS

Non- MTS

21. How many bunches of plantain do you harvest from MTS per year?
22. How many bunches of plantain do you harvest from non- MTS per year?
23. Has taungya improved employment situation in the community? Ans. Yes / No. Give reasons.
24. Are you aware of the benefit sharing proposal among stakeholders? Ans. Yes /No.
25. Have you signed any documents pertaining to your share of the timber trees? Ans. Yes / No
26. Have you acquired any physical durable assets since joining the MTS programme?
27. Have you received any training in conservation and management of the forest and in new technology for tree cultivation? Ans. Yes / No.
28. Has the programme impacted on your care of the children's education? Ans. Yes / No. Give reasons

29. Are there any changes in your livelihoods arising from the programme?

Ans. Yes / No.

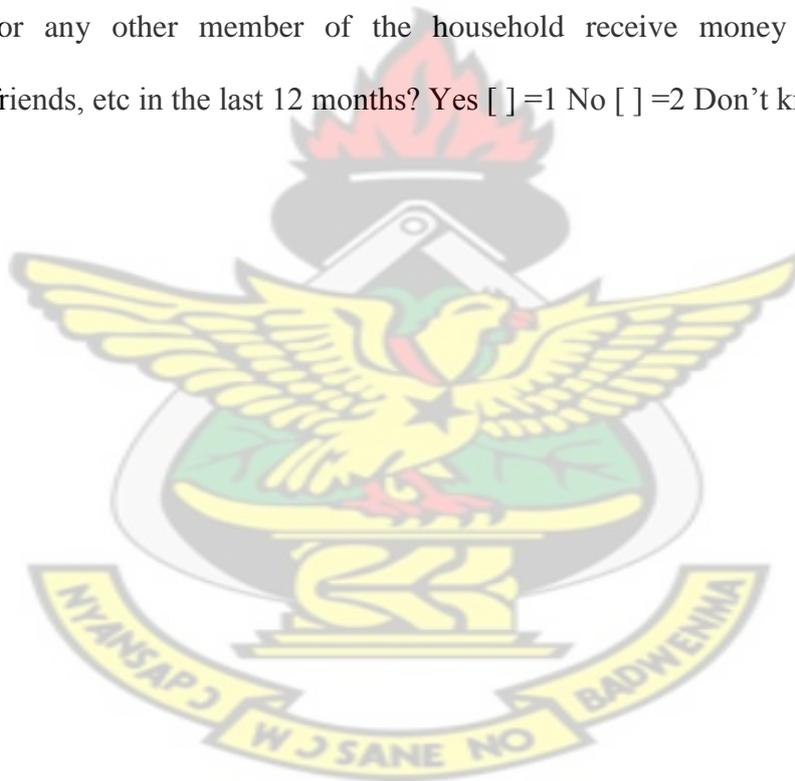
30. Does the programme train or supported you in any alternate livelihood? Yes / No

If yes, in what?

31. What is the wealth status of your household? Better-off =1 Average =2 Poor =3

32. Please indicate the proportion of the households' total food needs which your household is able to produce (tick one answer) 0-25% =1 26-50% =2 51-75% =3 76-100% =4

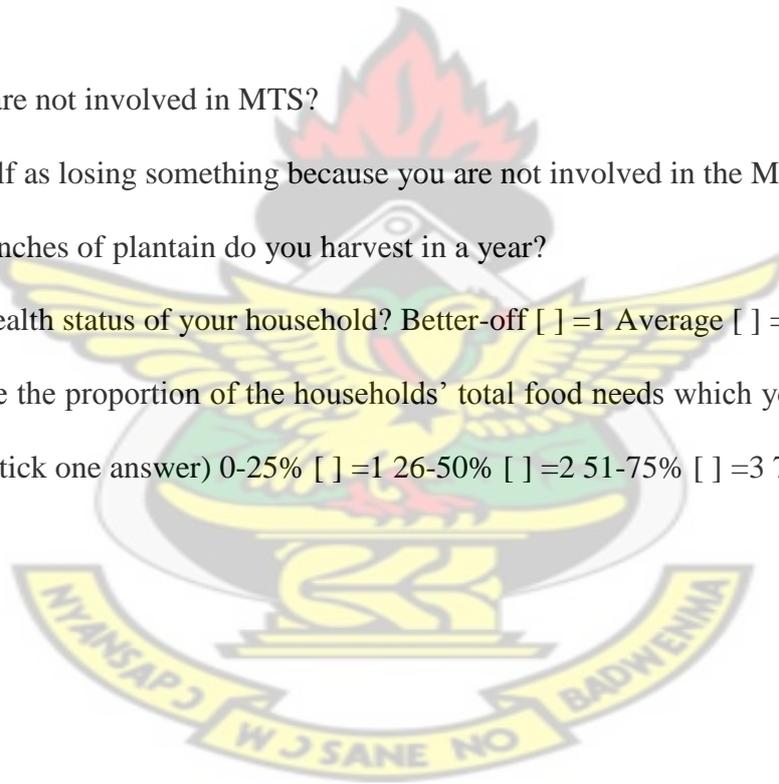
33. Did you or any other member of the household receive money from relatives, organizations, friends, etc in the last 12 months? Yes =1 No =2 Don't know =3



APPENDIX C

QUESTIONNAIRE FOR NON- MTS PARTICIPANTS

1. Gender: _____ Age: _____
2. Education Level: Primary: _____ JHS: _____ SHS : _____ Voc: _____ Tertiary : _____ Non formal : _____
None
3. What is the size of your Household? _____
4. What are the Sources of your Income: _____ Farming: _____ Collection of NTFPS: _____ Petty trading: _____
5. Why are you are not involved in MTS? _____
6. Do see yourself as losing something because you are not involved in the MTS? _____
7. How many bunches of plantain do you harvest in a year? _____
8. What is the wealth status of your household? Better-off =1 Average =2 Poor =3
9. Please indicate the proportion of the households' total food needs which your household is able to produce (tick one answer) 0-25% =1 26-50% =2 51-75% =3 76-100% =4



APPENDIX D

CALCULATION OF COST OF PLANTING PLANTAIN/ACRE

	YEAR3		YEAR2	
	Taungya	Non-taungya	Taungya	Non-taungya
1. Site preparation				
-Felling trees/ clearing burning	GH¢	GH¢	GH¢	GH¢
Maintenance	400.00	300.00	350.00	200.00
- 1st weeding	100,000	100.00	80.00	80.00
- 2nd weeding	100,000	100.00	80.00	80.00
- 3rd weeding	100,000	100.00	80.00	80.00
Plantain suckers	120.00	90,000	80.00	80.00
(GH¢30 *100 suckers)				
4. Total	820.00	690.00	670.00	520.00
5. Incidentals (10% of Total Cost)	82.00	69.00	67.00	52.00
6. Grand Total	902.00	759.00	737.00	572.00

APPENDIX E

Calculation of student t-test for mean bunches of plantain harvested per acre by farmers.

Plantain harvested by taungya and non-taungya farmers

Mean bunches of plantain harvested per two weeks

Year	Taungya (n=288)	Non-taungya (n=72)
Year1	13.34	9.41
Year2	25.33	18.26
Year3	35.8	25.51

$t=2.3885$, critical value = 0.025. $df = (n_1+n_2-2) = 4$, at 0.05. Decision = statistically significant.

Ho: The mean bunches of plantain harvested by taungya farmers per every two weeks between August and March, for three years is more than or equal to the mean bunches of plantain harvested by non-taungya farmers.

Ha: The mean bunches of plantain harvested by non-taungya farmers per every two weeks between August and March, for three years is less than the mean bunches of plantain harvested by taungya farmers.

APPENDIX F

CALCULATION OF RETURN-COST RATIO

The survey examined. The value of investment on land preparation for cultivation of plantain crop per an acre on both taungya and non-taungya farms were done. Assuming farm inputs to be fixed, i.e. cutlass, hoe, plantain suckers etc cost are fixed.

The Benefit-Cost Ratio (B/C) analysis was used to determine the relative benefits of both MTS farms and non MTS farms,. According to the model an activity should not be undertaken unless its total benefits (revenue) exceed its total costs (Agbeja, 2004).

Analytical tool for economic analysis

The discounted cash flow is the analytical tool applied for the analysis. The analysis involves the following measure: (B/C). The discounted gross benefit divided by the discounted gross cost. A decision of B/C is to accept projects with a ratio above one i.e. $B/C > 1$

$$\Sigma \frac{B_{t+n}}{(1+I)^n}$$

$$B/C = \frac{\Sigma \frac{B_{t+n}}{(1+I)^n}}{\Sigma \frac{C_{t+n}}{(1+I)^n}} > 1$$

$$\Sigma \frac{C_{t+n}}{(1+I)^n}$$

$$(1+I)^n$$

Formula for B/C: Where B = Benefits in each project year t, C= Cost in each project year t, n = Number of years to the end of project (n ranges from 1 to 2 years), I=Discounted rate (10%). The Discount Rate is the difference between the current price of a bill and its maturity value expressed as annual interest rate. The formula has been modified to suit the analysis for purposes of simplicity. Hence the operating formula is as follows:

$$B/C = \frac{\Sigma B}{\Sigma C} > 1$$

$$\Sigma C$$

Proceeds/ Returns

Harvesting of plantain commences from the month of August to the month of March.

Usually, harvesting is done every 2 weeks interval): Refer to Appendix 4 for details of calculated cost for two years.

1. The Benefits (B) is equivalent to the quantity of bunches of plantain multiply by price (QP * Pp) (14 weeks).

For years 2 and 3, the price per a bunch of plantain was as follows =GH ¢4.00 and GH¢8.000 respectively.

Using year 3 for analysis, the mean plantain production for the taungya farmer is 30. Thus, B = (GH ¢8.000*35*14 = GH¢3,920.00)

Given the formula for return cost ratio as follows: B/C>1

(3,920.00 / GH¢902 = 4.35). The ratio is 4.35 > 1.

2. The mean plantain production for Non-taungya farmer for year 3 is 11. Thus, B = (GH¢80.00 * 20 * 14 = GH¢ 2,240)

Given the formula for return cost ratio as follows: B/C>1

(GH¢ 2,240/ GH¢ 759 = 2.95). The ratio is 2.95 > 1.

Calculation for Year 2

Using year 2 for analysis the mean plantain production for taungya farmers is 25. Thus, B = (GH¢ 4.00*25*14 =GH ¢1,400.00)

Given the formula for return cost ratio as follows: B/C>1

(GH¢1,400 /GH ¢737.00 = 2.946). The ratio is 1.89 > 1.

2. The mean plantain production for Non-taungya farmer for year 2 is 11. Thus, B =

(GH¢4.00 * 18 * 14 = GH¢1,008.00)

Given the formula for return cost ratio as follows: $B/C > 1$

(GH¢1,008 / GH¢ 572 = 2.024). The ratio is $1.76 > 1$.

From the analysis, both farming systems had ratios greater than one, implying that both farming systems were economically productive. However, the ratios for MTS are greater than the ratios for non-taungya farming in both years. Thus, MTS is comparatively more economical than non-taungya farming.

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