ASSESSING THE RESPONSE OF CONTRACT TOBACCO FARMERS TO THE BRITISH AMERICAN TOBACCO (BAT) COMPANY REFORESTATION PROGRAMME IN OYANI, MIGORI DISTRICT

A Project Paper Submitted in Partial Fulfilment of the Award for the Masters of Arts Degree in Development Studies

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DECLARATION

I, the undersigned, declare to the best of my knowledge that this is my work and it has not been presented to any other institution for academic examination. Information from other sources have been duly acknowledged.

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This project paper has been submitted for examination with our approval as the University supervisors

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DEDICATION

To my late sister, Ruth Akoth, who passed away few days before I joined the Institute for Development Studies, University of Nairobi for the Masters programme.

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ABSTRACT

This study sought to assess the response of the contract tobacco farmers to the British American Tobacco Company Reforestation Programme in Oyani Area, Migori District. The study approached reforestation in Oyani as a process with different stages. In order to address the study topic, the following specific issues were examined: the distribution and acquisition of tree seedlings; actual planting of the seedlings acquired and compliance to the target set by the company; and lastly, the management of wood fuel for curing the tobacco crop. Both probability and non probability sampling techniques were used to select fifty BAT contract farmers who were interviewed. Ten non contract farmers were also interviewed as a control group. The study relied on both primary and secondary data. Primary data was gathered through a questionnaire survey, using both closed and open ended questions, key informant interviews and focused group discussions. The study had three key hypotheses. First, the number of trees acquired by contract farmers increased with one's proximity to the central nursery. Second, the number of tree seedlings planted increased depending on a higher level of labour supply. Third, farmers' levels of income determined the purchase of wood fuel in response to shortfall in wood fuel supply.

The study findings indicate that BAT farmers' response to the reforestation programme was positive evidenced by positive change in planting of trees compared to the period prior to the recent changes. Specific improvements noted were enhanced distribution and acquisition of tree seedlings. This was mainly due to the introduction of both central nursery and tractors to transport seedlings to farmers who stayed further away from the nursery site. The main problems experienced were destruction of seedlings in the process of transportation due to rough terrain and poor organisation at the collection site. The study also established that not all tree seedlings acquired were planted and the target set was not always met. There was, however, a general agreement among farmers interviewed that the number of trees planted in 2005 had improved and they were striving for the most part to meet the target set. Lack of adequate labour and acquisition of inadequate seedlings supply were cited as the main challenges experienced during the actual planting. Thus, the introduction of the central nursery addressed the problem of

inadequate labour required for nursery preparation but then sufficient labour was still required for actual planting. This meant that at the subsequent stage of tree growing the problem of inadequacy of labour remained.

The study established that some of the seedlings planted did not grow to maturity. This was due to certain problems encountered in the course of tree nurturing, including pest attack, loss to drought, animal destruction and browsing. The problems were attributed to lack of adequate extension services required to address challenges encountered in the process of nurturing. The study also established that not all trees grown to maturity were used for the intended purpose. The findings show that shortfall in wood fuel supply was a reality. A farmer could or not at all experience the problem depending on the farmer's ability to predict the immanent shortfall and undertake preventive measures. The main cause of shortfall in wood fuel supply was the fact that some farmers did not replace trees cut in the course of the production on the grounds that trees are naturally available. Farmers who experienced shortfall responded in different ways. Most of them purchased wood fuel from other sources. Thus, shortfall in wood fuel supply did not necessarily lead to farmers' exit from the production of tobacco.

All in all, it is apparent most of these problems were attributed to the company's approach to the programme. The company did not involve farmers and other stakeholders in the conceptualisation, design and the management of major aspects of the programme. Some problems like social cultural beliefs among farmers reflect what in the analysis of Douglas North (1990) would be referred to as institutional constraints. Nonetheless, there were also non institutional factors such as rough terrain which had negative effects on the programme. Some of the ways suggested to address these challenges are involving farmers practically in every stage of the programme, and allocating more resources to the reforestation programme.

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ABBREVIATIONS

ALAM	Agroforestry in Landscape Mosaics
ACIAR	Australian Centre for International Agricultural Research
AEP	Agroforestry Extension Programme
BAT	British American Tobacco
CARE	Concerned for American Relief Everywhere
CBO	Community Based Organisation
DANIDA	Danish International Development Agency
FGD	Focused Group Discussion
IDS	Institute for Development Studies
KWDP	Kenya Wood fuel Development Programme
KEFRI	Kenya Forestry Research Institute
MDFO	Migori District Forest Office
MDDP	Migori District Development Plan
SNAP	South Nyanza Agroforestry Programme
UON	University of Nairobi

CHAPTER ONE
INTRODUCTION

1.1 Background Information

This study assessed the response of contract tobacco farmers to the reforestation programme of the British American Tobacco (BAT) Company to address the problem of deforestation, which results from the production of this crop.

The crop's production especially in the developing countries has been linked to environmental degradation mainly because of the deforestation that results from it. As various studies show, its production leads to felling of trees for various reasons such as clearing cultivation fields, securing poles to construct curing burns and obtaining wood fuel for curing (Geist, 1997; Kweyuh 1997; Chapman 1997; Barr et al, 2004). Out of these, curing which requires burning of wood fuel is noted as the leading cause of deforestation. Whereas it is difficult to ascertain the precise amount of wood needed for curing tobacco, Madeley (1993) holds that in some countries it takes as much as three hectares of trees to cure one hectare of tobacco. Even though the situation varies among the tobacco growing countries depending on the species grown and the production technology adopted, Chapman (1997) holds that the case of deforestation in the developing countries is worse compared to that of developed countries. In Tanzania, there is evidence that each year about 99,000 acres of forest is cut down to cure tobacco (Hammond, 1997). A study conducted by Kweyuh (1997) also acknowledges that the problem of deforestation resulting from the production of the crop is a reality in Kenya.

In order to address the problem of deforestation, tobacco companies have initiated certain conservation measures with the aim to ensure that stocks of trees are not depleted in the course of the crop's production. They include agroforestry that constitutes both reforestation and community afforestation programmes; and use of modern curing burns with *venturi* furnaces, which they claim can save heat needed for curing by 30 percent of the amount of wood used (Geist, 1997; Barr et al, 2004; BAT, 2005). In countries like Zimbabwe, alternative sources of energy such as coal, oil and electricity are used instead of wood fuel. Amongst these conservation measures,

reforestation is the most common of them all, especially in countries where wood fuel is the major source of energy (Geist 1997; Chapman, 1997; Hammond, 1997).

In Kenya, BAT has a long history of engagement in agro forestry extension and support for the smallholder tobacco production in various parts of the country. They engage in both reforestation and aforestation, in order to realise sustainable wood fuel provision for tobacco curing and to conserve the environment. Each year, the company requires that farmers plant a given number of trees in order to replace the used ones (Kweyuh, 1997; Barr et al, 2004; BAT, 2005).

In spite of these arrangements, there are at any rate various case studies indicating that most of these conservation measures by tobacco companies are not living up to expectation. A case in point is Kenya where Kweyuh (1997) dismisses the BAT reforestation programme on the ground that the official figures given by the company about the number planted by contract tobacco farmers are far above the actual number planted. The position held by Kweyuh and other proponents of this school of thought implies that there is a problem with the response of contract tobacco farmers to the reforestation programme. Hence the focus of this study on the critical examination of Contract tobacco farmers response to BAT reforestation programme in Oyani West, Migori District.

1.2 Problem Statement

Since the introduction of the tobacco crop in Oyani just like in other places in Kenya, BAT introduced reforestation programme to ensure that trees cut in the process of production are replaced. In order to realise this, each contract tobacco farmer required to plant a given number of tree seedlings in a season. Initially the company provided contract farmers with seeds and 1000 poly-pots to raise their own seedlings. This was later reduced to 500 poly-pots. Tobacco farmers were required to establish tree nurseries in the same site with tobacco nurseries, near a reliable water point to enable them to attend to them at the same time.

However in 2003, the company drastically changed its approach. A central nursery, where seedlings were raised by the company and then given to farmers for actual

planting, was introduced. The main reason for this shift was that tobacco seedlings matured faster and ahead of tree seedlings leading to labour deployment to tobacco fields hence neglected tree nurseries (Kweyuh, 1997; Barr et al, 2004; BAT 2005). Consequently, as Kweyuh (1997) puts it, the tree seedlings could not reach even the actual planting sites. The introduction of a central nursery was therefore meant to address this particular problem. Apart from the shift in the approach to nursery establishment, the company further lowered the number of seedlings each contract tobacco farmer was required to plant, in a season, from 500 to 300. The assumption was that most of the farmers were not meeting the previous target set because the number was considered by most of them to be high hence unmanageable. Nevertheless, even with these changes, it still emerged that most of the contract farmers still neither planted all the seedlings acquired nor met the new target.

In 2004, the company threatened that it would not give farmers who failed to meet the targets set their bonuses that accrued from tobacco sales at the end of the season[1]. A follow up at the end of the season established that some farmers still did not comply and the company did not after all withhold the bonuses. The interpretation is that farmers' compliance was still wanting even with the introduced changes. This is an interesting turn of events given that tobacco farmers would be expected to willingly plant trees whether under aforestation or reforestation programmes since they need adequate stock of trees for the sustainable production of the crop. This study, therefore, sought to investigate factors that influence contract tobacco farmers' response to the BAT reforestation programme in Oyani Area.

1.3 Research Questions

This study sought to answer one general and four specific questions. The general question was how contract tobacco farmers responded to the company's reforestation programme and why. In order to address this question, the following specific questions were raised:

[1] Bonus refers to amount of money given to contract tobacco farmers at the end of the production season (usually in November) in addition to their tobacco sales in appreciation of their hard work. The amount given depends on both the quantity (i.e. kilograms) and the quality (i.e. grades) of tobacco produced and sold to the company by every contract farmer.

1. How were the tree seedlings distributed by the company acquired by the contract farmers in 2005?
2. Were all the seedlings received planted, and what determined variance in levels of compliance to the target set by the company among contract farmers in 2005?
3. Were there some contract farmers who experienced and others who did not experience shortfalls in wood fuel supply and what were their coping mechanisms?

1.4 Objectives of the Study

This study had one general and three specific objectives. The general objective was to assess the response of contracted tobacco farmers to the BAT reforestation programme. The specific ones were:

1. To examine the distribution of the tree seedlings and the extent to which contract farmers acquired them in 2005.
2. To ascertain the extent to which contract farmers planted the tree seedlings received and determine levels of compliance to the target set by the company per individual farmer, in 2005.
3. To find out contract farmers who, and those who didn't, experience shortfall in wood fuel supply in 2005 and analyse their coping mechanisms.

1.5 Justification for the Study

This study is justified on the following grounds. Findings can help formulate policies to address the problem of deforestation due to tobacco production. Addressing the problem of deforestation is a priority given that it has far reaching social, economic and ecological ramifications in any society more so the rural poor who depend on trees for their livelihoods. The success of the reforestation program is also significant to the tobacco companies and those who derive their livelihood from the industry. This is because the industry in Kenya entirely depends on wood fuel for curing hence the need to ensure sustainable use of trees. This is crucial especially in Migori District

where, at the time of the study, tobacco was one of the leading cash crops while agriculture offered 75 per cent of employment (Kenya, 2002). Available information also indicated that the number of tobacco farmers was increasing each year at a relatively high rate. This was likely to translate into more pressure on the national forest cover, which stood below 2 per cent for Migori District (Kenya, 2005).

Even though this study was carried out in Oyani West, Migori District, the findings can be used to inform decision-making in other places with similar situations. The findings are also expected to fill the gap which has not been given due attention in the tobacco control campaign. This is based on the assertion by the Tobacco Control Group that most of the efforts to control tobacco production have only been confined to health and child labour related issues at the expense of associated environmental problems yet they have far-reaching consequences.

There seems to be no readily available literature, specifically on the response of tobacco farmers to the BAT reforestation programme. The findings of this study should therefore be seen as an attempt to contribute towards that literature, its limitations notwithstanding. This study approached reforestation as a process. As a result, it went beyond actual planting of trees acquired to investigate the management regimes put in place to nurture trees planted. It also examined the management of wood fuel for tobacco curing in the context of the reforestation programme.

CHAPTE R TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

This chapter is divided into two major parts. Part one is on the general literature focusing on various farmers' behaviour towards the adoption of agro forestry practices. Part two discusses the institutional approach by North (1990) as the theoretical framework used to offer a systematic investigation into the research questions. The literature reviewed sought to provide a basis for addressing the following questions: How can the response of contract tobacco farmers to the BAT reforestation programme be explained? Specific questions include, why would contract tobacco farmers either acquire or fail to acquire tree seedlings? Why some farmers plant trees while others don't? Why some farmers plant more trees while others don't? Why some planted trees grow to maturity while others don't? Why some contract farmers experience shortfall in wood fuel supply while others don't? What determines variance in their responses to a shortfall?

2.1 Accessing Planting Materials

As argued by Bradley et al (1993) the first step for the distribution and acquisition of tree seedlings is their availability. This can be realised through raising seedlings in a nursery or direct sowing. Each method of propagation has both advantages and disadvantages and their appropriateness vary with the tree species. For instance, whereas the *eucalyptus* species can be only propagated through nursery seedlings, *grevillea robusta* can be raised either through nursery seedlings or direct sowing. However, in choosing the approaches, some of the key challenges that must be put into consideration include labour requirements, the risk of transplanting nursery grown seedlings (especially bare-root seedlings), and the sensitivity of seedlings that develop from seed sown directly.

It is necessary to have adequate labour for the actual nursery preparation and subsequent attention like watering, weeding and spraying with chemicals including insecticides. This is explicit in Kweyuh's (1997) argument, which attributes failure by farmers to plant trees under the BAT reforestation programme in Rangwe to poor attention to the tree nurseries. The company's requirement that nursery preparations

for both trees and tobacco seedlings begin at the same time resulted in inadequate labour supply for tree nurseries. Tobacco seedlings matured faster leading to the deployment of labour to the tobacco crop. As a result, tree seedlings were often abandoned hence hardly reached the field for actual planting. The central nursery approach was, therefore, introduced to address the problem of inadequate labour supply given that it transfers the responsibility of tree nursery preparation from tobacco farmers to the company (Bar et al, 2004).

Milimo (1989) points out the capability of the person in charge as an additional factor to be considered. The main argument being that proper nursery management is realised when the person in charge has both technical knowledge and skills on plant physiology. This is required to ensure proper germination of seedlings in the nursery which is often hindered by poor seed selection and pest; either in the nursery or during out-planting. In the absence of proper nursery management, some seedlings are also likely to die even before out-planting for instance due to pest attack. Seedlings are also likely to die in the process of transportation from the nursery site to the actual planting sites. This is common in the temporary sites where seedlings are placed before their actual planting (Milimo, 1989). The death of seedlings either in the nursery or in the process of distribution reduces the number of seedlings hence negatively affects the level of acquisition due to non-availability. These observations are interpreted to mean that, distribution and acquisition of tree seedlings is improved more in a situation where tree nurseries are managed by qualified persons; and adequate measures are also in place to avert destruction of seedlings in the course of transportation and vice versa.

Apart from availability and other risks associated with transplanting, literature reviewed (Bradley et al, 1993; Scherr, 1995; Kweyuh, 1997) further indicate that farmers' knowledge and preference of species available in the nursery also influence the nature and level of acquisition. Bradley et al (1993) note that farmers tend to prefer species of trees whose characteristics they are aware of to the ones they are ignorant about. Some features which farmers consider include the ability of the species to serve several purposes; lack of interfere with soil fertility; and fast growth,

which enables farmers to realise the benefits of the trees within a short time. A case in point is *grevillea robusta*, which is preferred by many farmers because it can be planted in almost every part of the farm, together with crops, without interfering with the soil fertility; yet it cannot be found easily due to limited availability of its seeds and seedlings. It is also noted that farmers tend to prefer exotic to indigenous species of trees mainly because of the perception that indigenous species are available locally and can regenerate naturally as opposed to exotic species. This is interpreted to mean that a tree nursery with exotic species encourages acquisition as opposed to the one with indigenous species. Another interpretation is that lack of adequate number of preferred species in the case of a central nursery approach is likely to negatively affect the level of acquisition on the one hand, while, availability of farmers preferred species in the central nursery is likely to enhance the levels of acquisition on the other hand (Chapman, 1997; TED Case: 252).

2.2 Participation and Ownership

Literature reviewed show that the choice of farmers to either plant or not plant trees for instance under BAT reforestation programme can be influenced by different factors. They include availability of tree seedlings for actual planting and the type of species; the approach used in the programme; property right or land tenure; availability and size of land for planting; household needs and livelihood strategies; labour supply and other external factors like historical changes which induces innovation among others.

The central thesis that underscores the question of approach is that good response to tree planting in a community-based programme can be realised if the approach in place is participatory. The basis of this observation is that a participatory approach gives room for active involvement of the intended beneficiaries and other stakeholders in the programme making them to own the process (Shepherd, 1998, Chambers, 1997). Taking cue from Shepherd and Chambers, a participatory approach in the case of BAT reforestation programme would require that farmers and other stakeholders are actively involved in deciding the species of trees to be planted; the time when actual planting should be done; the number of trees to be planted in a

season and any other important aspects of the programme. This position held by both Shepherds and Chambers is evident in the observations made in the Kenya Wood Fuel Development Programme (KWDP) on-farm trials in both Kakamega and Kisii Districts (Bradely et al., 1993); and Agrofoerstry Extension programmes in the former Siaya and South Nyanza districts in Nyanza Province (Scherr, 1995). Good responses by farmers in the two cases were mainly attributed to the participatory approach, which permitted a greater involvement of the intended beneficiaries in the decision making process regarding the species, uses, planting sites and management regimes.

According to Shepherd (1998) and Chambers (1997), poor response in such initiatives would therefore be explained in terms of to a top-down approach since it does not take views of the intended beneficiaries, like farmers in the case of BAT reforestation programme, into consideration. An example is given of the experience recorded in a rural development and an environmental project in the foothills of Himalaya. The project failed mainly due to negligence by its implementers to merge the project's activities and peoples' priorities (Shepherd, 1998). The next logical question to ask would be: why project implementers prefer a blue print approach or models yet they don't guarantee good results?

Available literature for example Korten (1990) cited in Shepherd (1998); and Chambers (1997) specifically blame it on the natural tendency of people in the upper level to dominate those who are in the lower levels. Korten further holds that in such contexts, technologies or approaches are developed in central places then transferred to the lower level. The assumption is that those who are at the upper or central levels are "know it alls". The result is a standard package, which does not take local conditions into consideration. The outcomes are always poorly conceptualised, designed and implemented projects.

The possibility of farm size being a determinant of farmers' response to adoption of agroforestry is also pointed out in some studies however, it is characterised by two lines of thought. One of them holds that planting trees in large numbers, like in the case of BAT reforestation programme, is not possible in a situation where one either

doesn't own a piece of land or has a small piece of land. Specific examples are San Francisco (1997) and TED (Case: 252). In both cases small scale tobacco farmers, in Malawi and Tanzania were not willing to use their small holdings to plant trees because they needed them for food crop production. Proponents of this line of thought also held the view that trees take long to grow to maturity hence the unwillingness to tie up their land for ten years or more just for the sake of ensuring sustainable wood fuel provision. In their view, wood fuel could still be obtained locally albeit with increasing difficulty. Lack of land does not only undermine planting of tree seedlings but is also an obstacle to meeting set target.

Farmers with small sizes of land are likely to plant relatively few seedlings compared to those with larger holdings. This is explicit in an argument advanced by Chapman (1997) that the demand by the company requiring every tobacco farmer to plant 1000 seedlings of *eucalyptus* trees each year is not possible in countries like Kenya. The basis of this argument is that such a target would require 1.5 hectares of land per farmer while the average Kenyan farmer has only between half and one hectares of land.

However, according to the other line of thought, the size of land is not necessarily an obstacle to tree planting. Instead, it can be a motivating factor. This is explicit under the induced innovation analytical framework advanced by Scherr (1995). In an attempt to explain farmers household tree planting strategies in the former Siaya and South-Nyanza Districts, Scherr contends that factors like increasing population density and subsequent declining farm sizes often create social needs for trees and shrubs as fences and boundary markers. Other instances where tree plating has intensified even amidst increasing land scarcity is when the act itself can lead to obtaining critical consumption goods which otherwise would be obtained by paying cash; diversifying sources of income; and protecting food security in the phase of declining crop yield. A study by Bradley et al (1993) under KWDP is clearer on this. The findings are categorical that farmers who participated in the programme did not cite size of land as an obstacle to the on-farm trials yet Kisii District, where the trials were done, is one of the most densely populated Districts in the country. Instead,

farmers who chose cropland as the most preferred planting site in most cases did it deliberately and mainly to intensify the use of woodland. There were few cases when intercropping was mainly due to lack of land. Going by these observations, one of the questions that this study sought to answer was: is land a determinant in farmers' response to the company's reforestation programme and if yes then under what conditions?

Closely related to the size of land is the question of ownership or tenure, which applies to both land and trees planted in it. The main argument advanced is that farmers are likely to plant trees where the concept of individual ownership is recognised. One proponents of this line of thought holds that situations of invariable and insecure land tenure like in many instances in the third world countries often undermine active involvement of poor farmers in land and forest conservation initiatives; and undermines their sub-optimal use and the management of natural resources in most parts of these countries Southgate (1988). The basis of this argument is that land ownership guarantees both access and utilisation of trees planted on it. The implication being that many farmers would be reluctant to plant trees in a situation where ownership is not guaranteed. A case in point is the reluctance by tenants in Bura Irrigation Scheme to plant trees, under the fuel wood development programme, due to perceptions of the place as their temporary place of residence (Omosa, 1987). This is interpreted to mean that tree planting can succeed in a situation where land ownership is guaranteed and vice versa.

The aspect of ownership also varies. As Scherr (1995) argues under the induced innovation framework, there are some instances when loss of communal land or restricted access to forest unlike in the case of individual ownership can also motivate farmers to plant trees. This is because in such cases, the affected persons are expected to have their own stock of trees as a coping mechanism. The aspect of ownership also takes a different dimension when viewed in the light of gender relations. There are some instances where some members of a community are denied ownership and access to trees based on their gender. A case in point is the practice by members of Luhya community. As Bradley et al (1993) point out, tree planting and ownership

amongst members of this community is a preserve of men mainly because of cultural beliefs. One of such beliefs is that: "...if a woman plants trees she will become barren." (Pg., 207). One of the effects is a skewed division of labour among members of households by leaving the responsibility of tree planting to only male members of households.

Availability of labour is also central in the actual planting of the acquired seedlings like in the case of nursery preparation and raising of seedlings. It can either enhance or hinder tree planting, particularly in a context where there are also other activities that equally require adequate labour supply. As Kuepper et al (2001) point out, tobacco production in most parts of third world countries is largely labour intensive. Availability of labour is therefore one of the factors that determine performance. This subsequently places more pressure on demand for labour especially in a situation where there are other side activities, which equally require the same labour supply. Thus, taking cue from Kuepper et al, one of the hypotheses that the study sought to test was the extent to which availability of labour determined response to actual planting of trees acquired. This line of thought is mainly influenced by Kweyuh's (1997) argument in an attempt explain poor response by the tobacco farmers to the BAT reforestation programme in Rangwe. He observed that tobacco farmers gave tobacco attendance priority whenever there was a clash in labour requirement between tobacco production and other responsibilities. The criteria used in this case were the economic value that would accrue from these activities based on the cost benefit analysis. Thus, whenever there was a clash, tobacco production was given priority on the grounds that it has more economic value and quick returns.

Farmers' perceptions on trees and its possible effect on their response to tree planting programmes is also pointed out by TED (Case: 252). This line of thought is based on observations made in Malawi where perceptions of small-scale tobacco farmers discouraged them from participating in tree planting under reforestation programme by tobacco companies. Like other wood users, they regarded wood as a free good, which are readily available in the natural forests. This is interpreted to mean that intensive tree planting, in such a context, can only be realised in the event that natural

forests or communal land disappear. As Barr et al (2004) note, such a response will be more of a coping mechanism. This further implies that there are certain conditions, like decline in the natural stock, that when experienced category of farmers actively participate in tree planting.

Scherr (1995) also underscores the concept of livelihood strategy and resource base as another determinant factor in an attempt to understand farmers' incentives to tree growing. The central argument in this thesis is that farmers may only be keen to grow tree as their main source of livelihood in the absence of alternatives. The key point is that a farmer who has sufficient alternative strategy for earning cash, for example from off farm or farm labour, is likely not to grow tree as a source of or a way of generating cash income. Likewise, a farmer with many members of his or her family working may have very little interest in farm wood fuel production. In the same vein, farmers with little household labour supply may place a higher value on time saved from fuel wood production. It is further argued that strategies are likely to change with changes in relative value of inputs, alternative tree outputs or output substitutes labour and land productivity and household assets. Financial discounts as well as the farmers' implicit discount rates for different types of farm activities will affect decisions making, as well as the degree of uncertainty of receiving benefits in the future (Scherr, 1995). In this case, therefore, farmers are not likely to plant trees in a situation where planting requires a lot of input of valuable assets or resources for instance man-hour which can be used elsewhere. This can be assets or other forms of resources like man-hour. This is also possible in the presence of substitutes or alternative sources of energy and when tree planting does not guarantee future returns (Ellis, 2000).

2.3 Nurturing of Planted Trees

Literature reviewed indicates that performance of planted trees varies with factors like species, planting sites, planting configurations and above all the management regime in place. This was evident during trials under KWDP in both Kisii and Kakamega Districts. The trials indicated that trees planted on cropland performed better than the ones planted on hedges and wood lots (Bradley et al., 1993). Reasons given include

fertility of croplands and frequent weeding of crops. Poor performance of trees planted on edges and woodlots was attributed to heavy competition from weeds and shading in the case of hedges while woodlots are often established on infertile soil, steep waterlogged and stony areas.

Management regime in place is also crucial in determining the performance of planted tree seedlings since agroferstry is associated with several risks. They include potential loss of trees to drought, browsing or disease, trees providing habitat for pest or disease or crops among others (Scherr, 1995). Besides planting site, Bradley et al (1993) also points out the variance among tree species. The basis of this argument is that different species require different treatment. For example, whereas some species like *mimosa scrabrella* require very good protection against animals during the first month of actual, other species may not necessarily require the same attention. Another example is that whereas weeding is considered important for all species, it is necessary for *caliandra calothrsus.* Again, while pruning is considered important for *grevillea robusta* in order to encourage straight growth, it is not necessary for some species. Lastly, while thinning is mostly recommended for the species like *sesbania sesban* because it generates naturally, some species do not require it.

A study conducted under the Australian Centre for International Agricultural Research (ACIAR) funded projects in Kenya to address the problem of wood fuel crisis also underscores the fact that survival of trees grown also depends on factors like site preparation, environmental condition; and the extent to which planted trees are exposed to animal destruction and pest attack Milimo (1989). Low survival rate is likely to be experienced in a situation where planting sites are not well prepared. This is due to the fact that there are species that can do better in pit planting while others require that the planting site is first cleared then ploughed. The significance of environmental condition is based on the fact that different species of trees require different amount of water in order to survive. Thus, in the case of species that require a lot of water, actual or out-planting should be done at a time when adequate rainfall is available. Instances of tree seedlings dying would therefore imply either lack of adequate rainfall or inadequate arrangements for watering. High susceptibility of most

of the species to termite attack, browse damage among others often occur in the absence of proper attention. These problems mostly affect *eucalyptus* species and are more prevalent in semi arid areas. Trees planted on unfenced open fields are vulnerable to animal damage. This was also evident during the ICIAR trials in Kenya where trees planted in Loruk, one of the establishment sites of the project, recorded a mortality rate resulting from animals' (goats, camels and donkeys') browsing (Milimo, 1989). It is because of these risks that it is recommended that replacements should be undertaken after some time, preferably after three months, in order to replace dead trees and eventually to achieve the expected output.

2.4 Wood Fuel Management

There are different types of energy that tobacco farmers can rely on to cure their crop. The choice of a particular source depends on factors like the type of tobacco to be cured, availability and the affordability of that source of energy. For instance, flue cured tobacco, which is the main species grown by most of the farmers in Oyani Area, requires a lot of heat thus can be cured by electricity, coal, oil and wood fuel. Fire cured tobacco, instead, requires less energy hence often cured either through open airing or smoking. Apart from wood fuel, which is used by most farmers, electricity, coal and oil are not used by smallholder farmers due to the high cost involved (Kweyuh, 1997).

Literature reviewed is categorical that anybody relying on wood fuel as the main source of energy, whether for domestic or other uses is likely to experience shortfall in wood fuel supply. Possible causes of shortfall include wanton felling of trees for use without commensurate replacement. A study in Malawi points out that, even though trees are renewable resources, without concerted and aggressive efforts towards either reforestation or aforestation, forest resources can be depleted, leaving the whole country without essential fuel (TED Case:252). Other factors that explain why people can experience shortfall in wood fuel supply include cultural perception and population growth. In this regard the study points at the unwillingness of some farmers to plant trees for sustainable wood fuel supply because of the belief that trees are naturally available. Scarcity of wood fuel due to population increase is attributed

to the rising number of people especially in the rural area who still rely on the agricultural sector as their main source of livelihood. As the number increases, pieces of land are cleared for cultivation hence reducing the sizes of natural forests and wood fuel by extension (Madley, 1993, Chapman, 1997). Going by these observations, farmers who experience shortfalls in wood fuel supply are therefore likely to be the ones who cut trees without commensurate replacement mainly because of farmers' beliefs that trees are naturally available and vice versa.

Of significance is the fact that even though the literature reviewed recognises the reality of experiencing shortfall in wood fuel supply, it also underscores the difficulty of clearly identifying the moment at which wood fuel scarcity becomes a real problem. Whereas there is a consensus that wood fuel scarcity is a reality, conceptually many factors come into play in an attempt to comprehend the situation. For example, when does one begin to consider the sufficiency of fuel wood supply; when can one say that the supply can be obtained with ease; what about the availability and affordability of alternative kinds of fuel like electricity among others? (Bradley et al, 1993). For instance, a person who can afford other alternative sources of energy may not really complain of scarcity or shortfall in a particular source of energy.

In the event of an evident shortfall, affected persons, like at the household level, also react in different ways. Available information shows possible responses such as intensifying tree production to replenish the depleted stock; finding substitutes or alternative sources of energy such as electricity, kerosene, in the case of household needs; increasing the efficiency of use of wood fuel for instance by using improved stoves in the case of domestic energy consumptions; and even acquiring wood fuel from a different source, for instance purchasing wood fuel from another source. The choice of any of these options is largely determined by their availability and the ability of the affected user to afford them (Bradley et al, 1993; Scherr, 1995).

2.6 Hypotheses of the Study

Based on the literature reviewed and the theoretical framework, the study was guided by the following hypotheses:

1. The number of tree seedlings acquired by contract farmers increased with the farmers' proximity to the central nursery.
2. The number of seedlings planted by farmers increased depending on a higher level of labour supply.
3. Farmers' levels of income determined the purchase of wood fuel in response to shortfall in wood fuel needs.

2.7 Definition and Operationalisation of the Key Concepts

- *Farmers' response to the reforestation programme*: Refers to the number of tree seedlings acquired from the central nursery, planted in field, trees grown to maturity and used for the intended purpose (i.e. curing tobacco, constructing tobacco burns among others).
- *Number of trees seedlings acquired*: Refers to the actual number of tree seedlings a tobacco farmer either collects or received from the company's central nursery in June, 2005.
- *Proximity to the central nursery*: Refers to the distance between a farmer's home to the central nursery site. In the case of Oyani West, farmers from Nyarongi were nearer to the nursery site compared to the ones from either Mwache or Owich.
- *The number of seedlings planted*: Refers to the actual number of trees transplanted in the actual planting sites. It was also measured in actual number of trees planted at the end of the last season.
- *Level of labour supply*: Refers to the amount of labour tobacco farmers used to plant tree seedlings acquired. It was measured in terms of the number of household members and the farmers' total monthly income, which they could have used to hire extra labour from other sources.
- *Compliance to the target set*: Refers to planting the number of tree seedlings the company required each contract tobacco farmer to plant in 2005, which was at least 300 tree seedlings. A farmer who planted 300 seedlings was considered compliant.

- *Response to shortfall in wood fuel supply*: Refers to strategies farmers use to address the problem of inadequate amount of wood fuel to cure their tobacco in 2005. Indicators were *purchasing wood fuel from external sources* (measured in terms of whether they purchased and the amount of money used to purchase wood fuel in 2005; *reducing the size of curing burns* (measured in terms of length, width and height used against the size recommended by the company); *reducing the number of curing burns* (measured in terms of the actual number of curing burns currently that was owned by each contract farmer at the time of the study compared prior to 2005; *skipping seasons without growing tobacco* (i.e. whether contract farmers grow the crop every season or do they skip some seasons); *forming clusters with non – contract farmers* (i.e. whether contract farmers are the sole users of their curing burns or they also invite non-contract farmers); *reducing the scale of tobacco production* (i.e. reducing the size of the farm compared to the previous seasons-measured in acres); *changes in wood fuel type used* (i.e. whether wood fuel used was from exotic or indigenous trees).

CHAPTER THREE
SITE DESCRIPTIONS AND METHODOLOGY

3.1 Site Description

The study site, Oyani West, covers parts of Nyatike and Suba-East Divisions in Migori District, one of the twelve Districts that form Nyanza Province. Migori District was curved out of the former South Nyanza District. The total area of the District is 2,505 sq km of which 475 sq km covers a section of Lake Victoria. It is divided into eight administrative Divisions, forty-six Locations, a hundred and seventeen Sub-Locations and four electoral constituencies (Kenya, 1997; Kenya, 2002). It borders Homa-Bay and Kisii Central District to the north; and Gucha and Trans Mara Districts to the east. Its southern boundaries are shared with Kuria District and Lake Victoria on its western boundaries.

The area is a multi ethnic with the major tribes being in the order of dominance, Luos, Basuba, Luhya and Gusii. Suba East Division has the highest population density in the region recording 476 persons per sq km. Nyatike is the most sparsely populated with a population of 67,906 people and a density of 143 persons per sq km. Majority of the rural poor in the District are found in the lower Divisions of Nyatike, Karungu and Muhuru due to the marginal nature of the region (Kenya, 1997; Kenya 2002).

Altitude ranges from 1,135m at the shore of Lake Victoria in Muhuru, Nyatike and Karungu divisions to 1700m with several undulating hills and plains stretching from 20 to 70km along the lakeshore. The major rivers are Kuja, Migori and Riana. Rainfall pattern in the District varies ranging from 700mm to 1,800mm annually. The long rains occur between March and May, while short rains fall during the October-December period. Climate is of a mild inland equatorial type, modified by relief, altitude and proximity to the lake. Nyatike Division has a comparatively harsher climatic condition than Suba-East. Like other lakeshore Divisions in the District, Nyatike experiences unreliable and poorly distributed rainfall (Kenya, 1997).

The area boasts of natural resources like land and soils, water, forestry among others. Arable land forms 70 percent of the total land surface in the entire district. The three main sources of water are surface, ground water and run-off. Agriculture is the mainstay of the majority of the District's population constituting 75 percent of the economic activities in the region. The average farm size is 3 acres in the case of small-scale farming and an average of 20 acres in the case of large-scale farming. The main cash crops grown include sugar cane and tobacco. However, the levels of agricultural activities vary with altitude, land size, rainfall and investment capabilities of farmers (Kenya, 1997; Kenya, 2002).

Out of fourteen areas under Oyani Leaf Center, the study only focused on contract farmers in Oyani West because of the following reasons. One, it was one of the production units with the highest number of farmers. Two, it was leading in the quality of the tobacco produced. Three, it was experiencing high rate of desertification. It occasioned the company to give it priority in implementing the company's agro forestry programme. Fourth, unlike other tobacco companies, BAT had along history in the area since it had operated in the area for over 20 years. Five, Oyani West was one of the areas in the District where tobacco was the main cash crop (Kenya, 2002).

Agroforerstry

At the time of the study the District had 237 hectares of gazetted and 547 hectares of ungazetted forests under trust lands. It is climatically favoured for forestry but due to increasing human settlements forest cover has been notably reduced. Considerable exotic forest cover had been created through various programmes with the forest department such as the South Nyanza Aforestation Programme (SNAP) (Kenya, 1997). Some of these exotic trees cover were evident in the 33 hills all over the District. The departments of forestry and agriculture carried out forestry activities in the District. Other organisations involved in various tree-plating activities in the area were tobacco companies, community based organisations and government parastatals as shown in Table 3.1.

Table 3.1 Summary of the tobacco companies involved in tree planting in the district

Tobacco companies	Period of operation	Objectives	Activities	Areas covered	Achievements
BAT (K) limited	Over 20 years	Wood fuel production and environmental conservation	Raising tree seedlings, tree planting & sponsoring tree planting functions	Tobacco growing areas under Oyani Leaf center	Raises over 1.5 million seedlings annually
Mastermind Tobacco (K) Limited	Over 5 years	„	„	Uriri and Suba-East Divisions	Raises about 250,000 seedlings annually
Stancom Tobacco (K) Limited	Over 3 years	„	„	Uriri and Sub-East Divisions	Raises about 150, 000 seedlings annually
Sony Sugar Company	Over 3 years	To raise seedlings for income generation and environmental conservation	Production of seedlings for planting in the company and government land	Awendo Division	Raises 70,000 seedlings annually
L.B.D.A	1 year	Catchment's protection	Raising seedlings	Rongo Division	Has a tree nursery
Green Belt Nursery	1.5 years	To protect the environment and to alleviate poverty among members	Raising seedlings and collection of tree seeds for sale	Riat area	Has a tree nursery
Others (i.e. CBOs)	Between 1 to 15 years	Income generation, poverty alleviation and environment protection.	Activities range from production of seedlings, tree planting, fruit tree and flower raising, land scaping and bee keeping	Different parts of Migori District	Has raised seedlings to be sold and planted by members

Source: Migori District Forest Office, 2005

Different organisations had different arrangements with regard to tree planting. British American Tobacco Company, for instance, required their farmers to plant a given number of trees each year. The specific number of trees to be planted had changed over time. Initially it was 1000 seedlings per contract farmer in a season. It was then reduced to 500 seedlings (Kweyuh 1997). At the time of this study, the

number had been reduced significantly. In Oyani area each contract tobacco farmer was required to plant at least 300 seedlings in a season.

3.2 Methodology

This section shows how this study was undertaken. Specific issues addressed are how the data required to answer the research questions were obtained, analysed and presented. It is divided into three sub-sections namely: research design, data collection, and data analysis and presentation.

3.2.1 Research Design

This study was mainly a survey research. It involved both qualitative and quantitative techniques. It had all tobacco farmers in Migori district as the target population. The area had about 300 contract farmers out of which a total of 50 contract farmers were interviewed. Ten non-contract farmers in the same area served as a control group given that they were more than contract farmers. The study therefore sought to gauge their behaviour in contrast to contract farmers. Both categories of farmers were identified through simple random techniques.

Individual contract farmer was the unit of analysis given that they were the ones who entered into a contract with the company. They also made most of the decisions at the household level with regard to tobacco production. Consequently, they were answerable to the company.

3.2.2 Data Collection

The following are the key information which was required to answer specific research questions:

a) Farmers' acquisition and distribution of tree seedlings

In order to address the question on acquisition and distribution, the following information was required: source of seedlings, means of transportation, timing of the nursery preparation, the first and the last time farmers acquired seedlings, distance between farmers planting site and the source of seedlings, problems experienced in

the course of transportation, species of trees available in the nursery and farmer preferences

b) Planting of the tree seedlings acquired and compliance to the target set

In order to address the question on planting of seedlings acquired and compliance to the target set the following information was required: the number of tree seedlings acquired, the number planted, whether a farmer planted all the seedlings acquired, type and availability of labour, reasons for not planting all the seedlings acquired, whether the target was met, reasons why target was not met, planting sites and reasons for their choices, type of labour used to plant the seedlings, amount of money used to hire labour, how the unplanted seedlings were disposed among others.

c) Nurturing of trees grown to planted tree seedlings

In order to address the question on nurturing on tree seedlings planted, the following information was required: problems or risks experienced in the course of nurturing, types of farmers responses to the problems, the number of trees grown to maturity under the programme and how they were used, and farmer's access to extension knowledge.

d) Shortfall in wood fuel supply

In order to establish how farmer managed their wood fuel the following information was required: where farmers cure their tobacco, source and type of wood fuel used for curing, amount of money used to purchase wood fuel, time used to gather wood fuel, size and number of curing burns, size of land under tobacco production, consistency with seasons, number of burn users, experiences and causes of shortfall, and coping mechanisms.

3.2.2.1 Primary data

Primary data was gathered through a survey, key informant interviews and focused group discussions. They were confined to 2004/5-tobacco production season.

Survey: This was conducted using questionnaires with both closed and open-ended questions. The questions were grouped under the following broad themes: a) general information b) distribution and acquisition of tree seedlings c) planting of the acquired tree seedlings c) nurturing of the planted tree seedlings, and d) management of wood fuel required for tobacco curing. The main survey involved 50 respondents who had been engaged with BAT (Kenya) as contract farmers for five years or longer. They were picked through the simple random sampling technique. Farmers' register obtained from the monitors was the sampling frame. It had a total of 300 names. Respondents were then picked through the simple random sampling technique. Three hundred names, corresponding to the names in the register, were written on 300 pieces of paper then folded. Fifty papers bearing different names were then picked at random.

Key Informant Interviews: Were specifically conducted to generate detailed information about tree planting and tobacco growing. A total of ten key informants were interviewed. They comprised two farmers' representatives, Assistant District Forest Officer- Migori District, two members of the Loans Committee, two Monitors, two prominent contract farmers and two non-contract farmers. They were selected purposively based on their expert knowledge and general experience in both tobacco production and tree planting. The interview was conducted with the aid of an interview guide. It had specific questions corresponding to the four broad themes. Information obtained was meant to compliment findings from the survey.

Focused Group Discussions: Three of them were conducted to generate detailed information to be used to explore the broadness of issues. The one conducted in Lower Oyani West had 10 participants while the one for Upper Zone had 11 participants. The focused group discussion for non-contract farmers had 10 participants. It generated detailed information on issues related to the research questions meant to compliment the findings from individual contract farmers. The findings were also used to explore the broadness of issues and to compliment findings from individual farmers. Like key informants, participants were picked purposively based on their experiences on tobacco production and tree planting. The discussion

was also guided using and interview guide with open ended questions corresponding to the four broad research themes.

3.2.2.2 Secondary Data

Secondary data was obtained through review of both published and unpublished works with information relevant to the study. Published works included books, journal articles and other documents or handouts obtained from the monitors, farmers, government offices and during key informant interviews. Journal articles were mainly downloaded from various websites. Unpublished reports included conference papers and other relevant documents on tobacco and deforestation. Literature review was conducted throughout the research period. Information obtained was used to compliment primary data.

Challenges experienced during data collection and how they were addressed

In order to ensure that data collected remain valid and reliable there was a detailed probe on each question especially where the issue to be addressed depended on the memory recall. For instance, questions like the first and the last time contract farmers acquired and planted tree seedlings under the programme; the number of seedlings acquired and planted; some salient features exhibited by certain species in the course of nurturing among others.

In order to avoid cases on dishonesty farmers were first given explanations on why the study was being undertaken. This was to avoid possibilities of getting inaccurate or outright false information. For instance, avoiding possibilities of farmers giving false information with regard to questions like farmers' total monthly income, compliance with the target set by the company and the size of land, which farmers apportioned for various activities like tree planting. This was possible since some farmers questioned the intention of the study. They suspected that it could have been a ploy by either the government or the company to find out the etent of farmers' participation in the programme with a view of punishing those who didn't comply as required.

Given that some questions, such as the approximate distance between planting site and the BAT collection points, depended on the ability of the respondents to give good approximations or estimations, the researcher engaged research assistants from the area who are acquainted with its geography. They were to ensure that farmers did not give false information. The researcher is also from the same areas thus equally well conversant with the geography and other dynamics in the crop's production.

Another challenge experienced in the field was the reluctance of the technician in charge of the programme to grant official interview and to provide other pertinent sources of information such as policy documents in order to get the official view of the company on farmers' response to the programme. Bureaucratic obstacles frustrated several attempts to access this particular information. In order to mitigate these shortcomings, the researcher relied on the two monitors who work hand in hand with the technician in order to get information required to fill missing gaps. The fact that information obtained from them were not conflicting is an indication that they gave the right information. Some booklets and other documents on the programme were also obtained from them. This was complimented with information obtained from the company's website (http://www.batkenya.com).

3.2.3 Data Analysis and Presentation

Data collected were analysed using both qualitative and quantitative techniques. The process of analysis started by coding qualitative information gathered from the field. The Statistical Package for Social Sciences (SPSS) was used to run and give graphic representation of the frequency distribution. Cross tabulations were used to establish variations between variables in the hypotheses. The findings were then presented with the aide of frequency tables accompanied with detailed explanations going by the specific research questions.

CHAPTER FOUR

DISCUSSIONS OF THE FINDINGS

This section focuses on the BAT formal arrangements for tobacco production in Oyani, Migori District, socio-economic characteristics of both the contract and non-contract farmers interviewed; the distribution and acquisition of tree seedlings; actual planting of the seedlings acquired and compliance to the target set; nurturing of planted trees; and the management of wood fuel for tobacco curing.

4.1 BAT Formal Arrangements for Tobacco Production in Oyani Area

Tobacco Production in Oyani Area

The British American Tobacco Company (BAT), a leading tobacco company, has been operating in Kenya since 1907. Currently, the company has a market share of 78 percent of legitimate cigarette market in the country and 9000 contracted tobacco farmers in Eastern, Western and Nyanza Provinces (*http://www.batkenya.com*). These zones are further subdivided into areas under the supervision of Area Leaf Managers. Initially, Oyani area only covered two administrative Divisions within Migori District. However, at the time of the study, it covered two additional Districts: Homa-Bay and Suba. Thus, the number of contracted farmers and crop's acreage have continued to increase overtime.

Oyani West falls under Migori District where tobacco is the leading cash crop (Kenya, 2002). Other tobacco companies operating in the District are the Mastermind Kenya Limited and the Stancom Tobacco Kenya Limited. At the time of the study, BAT was the leading player both locally and nationally. The Company grew two varieties of tobacco namely Dark Fire Cured (DFC) and Flue Cured Variety. Each year, the company carefully selected new and returning farmers for tobacco growing contracts. New farmers were assessed based on the size of their plots, the acreage of tobacco they were interested in growing and the quality and quantity of their land. Farmers owning at least 3 hectares of land were required to be willing to put at least 0.6 hectares towards tobacco production. This must be rotated with other crops every three years (Barr et al, 2004; BAT, 2005). Once recruited, farmers were given inputs on credit for both tobacco and tree planting, which they were required to pay back

through deductions from the tobacco sales. At the time of the study, new recruits were given a loan worth Ksh 7000 from which they were supposed to use to produce 500 Kgs of tobacco.

The crop's production is divided into the following key areas: transplant production, field growing, harvesting, curing and marketing (Kuepper et al, 2001). In Oyani Area, the production began in September every season with nursery preparation and ended in July with the purchase of the cured leaves from the farmers. Buying sheds or centers were located in close proximity to the tobacco farms. The purchased leaves were categorised and transported to the Green Leaf Threshing Plant (GLTP) in Thika Town where they were further processed and packed for manufacturing of cigarettes (*http://www.batkenya.com*).

Oyani area had one Area Leaf Manager, fourteen Leaf Technicians and one Field Technician. The Area Leaf Manager was the Center's overall boss in charge of administrative issues and answerable to the Divisional Leaf Manager based at Thika. Each of the fourteen Area Leaf Technicians was in charge of extension services in each of the fourteen production units within Oyani Area. They were to ensure that tobacco production is done as required. Most of them were graduates with extensive knowledge in agricultural extension. Occasionally, they attended training on tobacco production organised by the company. The company also provided each of them with a motorcycle for field visits. The company also employed Monitors on a casual basis to assist them. They were recruited from their respective areas and were required to be constantly in touch with farmers. All of them had attained form four level of education. Unlike the Area Leaf Technicians, the company gave them bicycles.

Unlike in the case of tobacco production where each area had a Leaf Technician, there was only one Field Technician In Charge of Agroforestry in all areas under Oyani. He was also being assisted by the Monitors. The company also provided him with a motorcycle, which he used to visit farmers on a weekly basis from the time of nursery preparation to transplanting of seedlings to respective farmers' sites. The Technician was a Diploma holder and also occasionally attended trainings sponsored by the company on agroforestry.

There were also Loan's Committee Members and Farmers' Representatives elected by contract farmers in each area. Their main work was to assist the company in recruiting new farmers every season and to vet farmers when loans were being given for the crop's production. They were experienced contract tobacco farmers who had grown the crop under the company for a long time. Farmers' representatives acted as the link between farmers and the company. Their main responsibility was to present farmers' views or grievances to the company. Thus, at the time of the study, Oyani West had one Area Leaf Manager, fourteen Area Leaf Technicians, one Field Technician, two Farmers' Representatives, two Monitors and ten Loan Committee Members.

Agroforestry in Oyani

In Kenya, BAT has a long history of engagement in agroforestry extension and support for the smallholder tobacco production in various parts of the country. The objective of the programme is to enhance sustainable wood fuel production for tobacco curing and environmental conservation in areas under Oyani Leaf Center. Core activities include raising trees, tree planting and sponsoring tree planting functions. The company raises over 1.5 million seedlings annually for the entire area (Kenya, 2005).

Each year, the company requires that farmers plant a given number of trees in order to replace the used ones (Kweyuh, 1997; Barr et al, 2004; BAT, 2005). Since the introduction of reforestation in Oyani, the company had effected changes in the programme with the overall objective of improving the number of seedling farmers planted in a season. In the 2004/2005, the company established its own central nurseries, in different parts of the area, where seedlings were raised then given to farmers. The one for Oyani West was established in a piece of land set a side by one of the contract farmers in a place known as Nyarongi. As a requirement by the company, the piece of land was adjacent to River Migori because of reliable and adequate water required to raise seedlings. Given that BAT's reforestation programme required that tree planting was undertaken concurrently with the production of the crop, tree nursery preparation commenced in September 2004 together with the preparation of nursery for tobacco seedlings. The site was first cleared then ploughed under the supervision of the Technician In Charge of Agroforestry. Thereafter, the

company, through tendering, engaged a third party to take care of the nursery under its overall coordination. The seedlings raised in the nursery were ready for collection for actual planting by May 2005.

Unlike in the previous seasons, the company introduced a tractor to help in transporting tree seedlings to farmer who lived a distance away from the nursery site. Oyani West was served by one tractor. It collected tree seedlings from the central nursery and offloaded them at Mwache and Owich Primary Schools for farmers who lived in areas around the two institutions. Thereafter, farmers picked them to their respective planting sites using their own means.

4.2 Socio-Economic Characteristics of the Respondents

Among the contract farmers interviewed, 74 percent were men. The rest (26 percent) were women. In the case of non-contract farmers, 80 percent were men while 20 percent were women. The ages of the contract farmers ranged between 25 and 68 years. Majority of them (60 percent) were 30 years and above. The ages of non-contract farmers had a mean of 31.8 and ranged between 22 and 56 years. Two of the contract farmers interviewed were widows while the rest were married. For non-contract farmers 70 percent were married, 20 single while 10 percent were still single. Members of the contract farmers' households constituted a mean of 6 and a range of 3 and 10. The ones of non-contract farmers had a mean of 5 and ranged between 1 and 10. Majority of the contract farmers (80 percent) were members of the evangelical churches. Out of the remaining, 10 percent were Catholics, 6 percent were members of the *Legio Maria* sect while 4 percent members of the Seventh Day Adventist. Majority of the non-contract farmers were also members of evangelical churches (50 percent). The rest belonged to catholic (30 percent) and Seventh Day Adventist (20 percent).

Most of the contract farmers attained primary education (84 percent). Only 4 percent had reached the tertiary level: they had trained as primary school teachers. The remaining 12 percent did not have any formal education. Out of the non-contract farmers interviewed, only one of them had reached secondary school. The rest (90 percent) had only attained primary school level of education.

Both contract and non-contract farmers had three main sources of income namely farming, off-farm activities and remittances. In the case of contract farmers interviewed, farming constituted 70 percent and mainly involved food crop and smallholder tobacco production. Off-farm activities constituted 22 percent. It mainly involved livestock trading, selling of grains and retail shop keeping. Remittances accounted for the remaining 8 percent. All the respondents relied on more than one source of income. They reported that they did so in order to reduce risks associated with relying on only one source of income. Non-contract farmers made similar observations.

Land owned by both contract and non contract farmers fell under three categories of ownership namely ancestral or inherited, purchased and lease or rental. In the case of contract farmers, ancestral or inherited constituted slightly above 72 percent, purchased land constituted 12 percent while rental or leased land constituted 16 percent. Some farmers had more than one type of ownership. For instance, those who had small pieces of inherited or ancestral land had either purchased or rented another piece of land for a given period of time or opted for both. Pieces of land owned by the contract farmers interviewed ranged between 2 and 25 acres with a mean of slightly over 7 acres while for non-contract farmers it ranged between1 and 42 acres with a mean of 7.3 acres. Both categories of farmers acquired their pieces of land at different periods of time. Contract farmers acquired their pieces of land as follows: 68 percent between 1966-1995, 30 percent between 1996-2005 and 2 percent between 1960-1965. Non-contract farmers acquired their pieces of land as follows: 60 percent between 1998 -2005 and the rest (40 percent) between 1972 -1997.

Both contract and non-contract farmers put their pieces of land to different uses. Tobacco farming, due to its high economic value, was apportioned the most fertile and the biggest piece of land. Farmers argued that the crop matured faster and had higher economic gains compared to crops like cassava which took long to mature. This was followed by food crops mostly cassava, maize and millet. Farmers indicated that these crops were necessary for subsistence. They constituted the main staple food stuff in the region. Farmers who had access harvest often sold some portion in order to get money to meet other family demands. Allocation for pasture ranked third due to the declining number of livestock and the rapidly changing methods of rearing them.

There was a gradual shift from free range to either zero grazing or tethering; and the collective use of pasture. Trees and other uses like building sites and settlements were apportioned the smallest and the least fertile piece of the land. This was mainly due to the low economic return that farmers expected from this particular land use.

4.3 Distribution and Acquisition of Tree Seedlings

This section examines the arrangements by the company to enhance the distribution and acquisition of the seedlings. Specific issues covered include sources of tree seedlings, means of acquisition, problems encountered during acquisition, number of tree seedlings acquired and time of acquisition, species of trees acquired and reasons for preferences. The section is based on the premise that for BAT contract tobacco farmers to plant trees as required by the company, the first step is to ensure that tree seedlings are available. The key hypothesis was that the number of seedlings acquired by contract tobacco farmers increased with the famers'proximity to the central nursery.

Sources of Tree Seedlings

Information obtained from farmers and Migori District Forest Office (Kenya, 2005) showed that apart from the BAT Company, there were other tree nurseries within the District established by other players. They included the Mastermind Kenya Limited, the Stancom Kenya Limited, ten Community Based Organisations (CBOs) found in different parts of the District, the Government District Forest Office, Parastatals like Sony Sugar Company and the Lake Basin Development Authority (LBDA), the Green Belt Movement and individual farmers, some of whom were not involved in tobacco production. They had different varieties and quantities of seedlings in their respective nurseries.

In 2004/2005, the BAT had over 1.5 million tree seedlings in their central nursery as shown in Table 3.1. All the players had different arrangements and approaches. Four distinct points were noted. First, whereas the tobacco companies provided seedlings for free, other sources like the District Forest Department, CBOs and individual farmers charged a fee depending on the species in demand. Second, the tobacco companies had specific periods for collection for example, between May and June in the case of BAT but others, apart from the Mastermind Kenya Limited, had tree

seedlings ready for acquisition throughout the year. Third, whereas the BAT company had only two species of trees (i.e. *eucalyptus* and *grevillea*) other players like the District Forest Department, CBOs and individual farmers had varieties of species, including fruit tree, in their nurseries. Fourth, while tobacco companies offered means of transport to their contract farmers who lived far from the nursery site, other players had no specific transportation arrangements for their customers.

The presence of other players provided some contract farmers who were interested in tree planting with additional sources for acquisition. This was confirmed when the contract farmers interviewed indicated that they acquired their tree seedlings from four different sources as shown in Table 4.1.

Table 4.1: Sources of tree seedlings acquired by BAT contract tobacco farmers in 2005

Source of Seedling	**Frequency**	**Percentage**
BAT nursery	38	76
Individual Nurseries	6	12
BAT Farmers	2	4
BAT nursery & BAT farmers	1	2
BAT & individual Nurseries	1	2
Other	2	4
Total	**50**	**100**

Source: Computed from the Field Data, 2005.

Majority (76 percent) acquired seedlings directly from the company's central nursery; 12 percent relied on their own nurseries; 4 percent were given seedling by other BAT tobacco farmers; while another 4 percent acquired their seedlings from other sources such as Mastermind farmers' and the nursery raised by the District Forest Department. The remaining respondents (2 percent) relied on more than one source. In addition to the company's central nursery, one of them got additional seedlings from his own nursery while the other got from other BAT tobacco farmers.

Farmers who acquired seedlings from other sources reported that they did so because they considered the company's arrangements to be limiting in some ways. The seedlings had to be acquired at a specific time of the year around May. Most of the

respondents argued that precisely at that same time, they were occupied with harvesting, sowing, curing, sorting of tobacco leaves and selling them to the company hence the shortage of adequate labour supply. As a result, some farmers were not able to acquire seedlings from the BAT nursery. The problems of inadequate labour supply raised by farmers is a pointer to the labour intensive aspect of tobacco production in most developing countries as pointed out by Kuepper et al (2001) and Kweyuh (1997).

Farmers also argued that the time of acquisition was also unsuitable due the prolonged dry spell, which followed immediately after planting. Planted seedlings, therefore, had a low survival rate. This discouraged some farmers from acquiring seedlings from BAT to plant. Some farmers reported that other players like the Mastermind Tobacco Company were offering flexible alternative arrangements especially with regard to timing. Unlike the BAT, the company distributed tree seedlings in October, a period majority of the contract farmers interviewed considered appropriate in terms of availability of both adequate labour and rainfall. Going by the tobacco production cycles, this is the period when tobacco farmers are already through with the production and are just planning to begin a new season. It is also the beginning of the short rains. It is therefore more conducive to tree planting.

These findings imply that timing of nursery bed preparation is important. Proper timing ensures that seedlings are ready for planting when there is both adequate labour supply and rainfall. Thus, according to farmers interviewed, poor timing of nursery preparation was one of the problems that affected the company's reforestation programme. Farmers attributed failure by the company to take this into consideration to lack of their involvement in deciding the timing of nursery preparation. They felt that they were able to tell when there is both adequate labour supply and rainfall. Despite this, the company did not consult them. Their view conforms to the argument raised in support of stakeholders' participation in decision making processes by researches on community based development projects (Chambers, 1997; Shepherd, 1998).

The fact that some farmers opted for other sources of seedlings specifically to get other species of tree implies that they consider different factors during acquisition.

For instance, some farmers reported that they were not able to get *grevillea* from the central nursery because they were few. As a result, they had to buy them from other sources. This observation means that farmers should not be confined to a particular source or species. It is also consistent with the argument raised by both Bradley's (1993) and Scherr (1995). They hold that acquisition of tree seedlings for planting by farmers is partly influenced by farmers' knowledge and preference for different species. Some farmers are therefore not likely to pick seedlings from the central nursery, for instance, if what is available is not their preference. This is most likely when there is an alternative source which provides other preferred species. Farmers interviewed in Oyani were also quick to note that alternative sources are only useful if the cost of acquiring seedlings is affordable. They pointed out that the high cost of accessing the other sources was the main reason why few farmers acquired their seedlings from them compared to the company's central nursery.

Information obtained indicates that non-contract farmers acquired fewer seedlings compared to contract ones mainly because most of them relied on contract farmers to get seedlings from the central nursery. They attributed their continued reliance on contract farmers, to acquire seedlings from the nursery, to the old company rule, which recognised only contract farmers. They pointed out that it is one of the reasons which contributed to their poor response to the reforestation programme.

The findings show that availability of seedlings was not a serious problem as it used to be prior to 2005. The introduction of the central nursery prepared by the company and the presence of other sources presented each farmer with access for seedlings to plant. Therefore, the introduction of the nursery specifically and to a large extent addressed the problem of inadequate labour for nursery preparation. This had been pointed out as one of the constraints the reforestation programme faced in some places like Rangwe (Kweyuh, 1997). The effect was experienced more among contract farmers than the non-contract ones.

The Distance between the Central Tree Nursery and Farmers' Planting Sites

The study sought to test the hypothesis that farmers who lived nearer to the nursery site acquired more tree seedlings compared to the ones who lived further away from

the site. It was based on the premise that farmers who lived nearer to the nursery site were in a position to collect as many seedlings as they wanted.

Even though information from the focused group discussions also supported this line of thought, findings in Table 4.2 do not. Instead, evidence shows instances where some farmers who lived further away from the nursery site even acquired more seedlings than some who lived nearer to the nursery site. A case in point is the fact only 8 percent of all farmers who lived nearer to the nursery site, which is within a distance of 1 to 2 kms from the site, collected more than 500 seedlings, the highest number collected in 2005. A similar percentage (8 percent) in the same category also collected the least number of tree seedlings (1-100) in the same year. Again, contrary to the expectation, most of them (33 percent) acquired between 101 and 200 seedlings. It is also evident in Table 4.2 that there was a farmer in this category who did not even acquire any seedling in spite of the fact that s/he lived nearer to the nursery site. The same Table also shows that majority of farmers (about 28 percent) who lived far from the site (i.e. 5.1kms to 7kms) collected between 201- 300 seedlings. There were even more farmers (10 percent) in the same category who acquired the highest number of seedlings in the same season compared to the other category. It had one (8 percent) who collected the highest number of seedlings. On the contrary, analysis in the same Table shows that whereas majority of farmers (33 percent) who lived nearer to the nursery site collected between 101-200 seedlings, majority of farmers who lived further away from the site acquired between 201-300 seedlings.

Table 4.2: Approximate distance between the central nursery and farmers' actual planting sites and the number of seedlings acquired in 2005.

Number of seed-lings acquired by farmers	Approximate distance			
	<1-2km (n=12)	**2.1-5km (n=17)**	**5.1-7km (n=21)**	**Total (n=50)**
None		6%	5%	4%
1-100	8%		14%	8%
101-200	33%	18%	20%	22%
201-300	17%	23%	28%	24%
301-400	17%	23%	14%	18%
401-500	17%	12%	10%	12%
> 500	8%	12%	10%	10%
Forgotten		6%		1%
Total	**100%**	**100%**	**100%**	**100%**

Source: Computed from the Field Data, 2005.

The findings in Table 4.2 are interpreted to mean that distance did not necessarily determine the number of seedlings farmers acquired in 2005. It, therefore, fails to bear out the hypothesis that the number of seedlings acquired by contract farmers increased with proximity to the central nursery. The same was the case of non-contract farmers given that they relied on contract farmers to acquire tree seedlings.

The outcome is mainly attributed to two reasons. First, farmers who lived further a way from the nursery site relied on the tractor to transport their seedlings. It reduced the burden of transportation of seedlings physically. Second, there were also instances when some farmers who lived further away from the nursery site even went as far as carrying additional seedlings either on the head or using bicycles. They were able to acquire adequate seedlings.

Transportation of Seedlings

Contract farmers interviewed transported seedlings from the nursery site to various planting site using the following means as shown in Table 4.3: tractor provided by the company (58 percent); bicycles (20 percent); carrying on head (16 percent); both tractor and bicycles (4 percent); carrying on the head and using bicycle (2 percent).

Table 4.3: Means of transportation for tree seedlings in 2005.

Means of Transport	**Frequency**	**Percentage**
Tractor	29	58
Bicycle	10	20
Carrying on head	8	16
Tractor and bicycle	2	4
Bicycle and carrying on Head	1	2
Total	**50**	**100**

Source: Computed from the Field Data, 2005.

Farmers who relied on the tractor provided by the company lived further a way from the nursery site. Most of them were from Owich and Mwache areas. The tractor off loaded seedlings at Owich and Mwache Primary Schools respectively from where they collected and ferried them either on the head or by bicycles to their planting sites. Owich and Mwache Primary Schools were considered to be central places and relatively near to this particular group of farmers.

Farmers who lived nearer the nursery site (mostly Nyarongi area) relied mainly on bicycles or carried seedlings on the head. Those who relied on more than one means of transportation (i.e. both tractor and bicycle or bicycle and carrying seedling on the head) reported that they did so in order to account for any shortfall in the number of seedlings that could result from relying on a particular means of transport. Most of these farmers reported that they wanted to plant as many seedlings as possible. They also had their own targets which they were determined to meet. Non-contract farmers used the similar means of transport used by farmers given that they relied on them.

The above findings also support the findings in Table 4.2 which show no direct relation between the distance and the number of seedlings acquired by individual farmers in 2005.

Farmers also encountered some problems in the course of transportation of seedlings from the central nursery. They included destruction of tree seedlings (50 percent); heavy load for those who either carried them on their heads or used bicycles due to the distance to be travelled (25 percent); and poor organisation at the collection points (25 percent) for those who relied on the tractor provided by the company as shown in Table 4.4.

Table 4.4: Problems encountered by some contract farmers during the acquisition of tree seedlings in 2005.

Problem Encountered	**Frequency**	**Percentage**
Destroyed seedlings	20	50
Poor organisation	10	25
Far distance/ Heavy load	10	25
Total	**40**	**100**

Source: Computed from the Field Data, 2005.

Farmers affected by the destruction of seedlings blamed it on the rough terrain and poor road network in the area. Consequently, some seedlings got broken while others lost soil from their roots. It, subsequently, reduced the number of seedlings suitable for planting by the time they reached their various destinations. Even though farmers did not authoritatively indicate the number, there was consensus that they were fewer than the remaining ones.

The finding is akin to the one recorded by Milimo (1989) in Loruk, which underscores the possibility of seedlings dying in the process of transportation from the nursery site to the actual planting site. However, what is noted is that where as the case of Loruk was attributed to mismanagement, the case of Oyani was mainly due to the rough terrain that characterised the road network in the area. Due to the problem, some seedlings did not reach the actual planting sites. The situation was compounded

by the fact that the company did not have any specific measures to address the problem. This particular finding shows that poor response to the programme is a function of several factors. They are not all institutional in nature as argued in the theoretical framework. Instead, factors like the physical environment can also affect the output of the programme especially in a context akin to Oyani.

The problem of poor organisation at various collection points for instance in Owich and Mwache Primary Schools was attributed to lack of rules or regulations for instance, to guide the collection of the tree seedlings once they were offloaded from the tractor. As a result, some farmers had undue advantage over others in terms of the number of seedlings and species collected. Farmers interviewed reported that those who arrived first, either due to their proximity to the site or other factors, often took the best seedlings, preferred species and as many seedlings as they could. Thus, farmers who lived further away from the collection points or received information late had no option but to acquire tree seedlings from the remaining lot. Often they got few seedlings and not very good ones.

The problem of heavy loads mainly affected farmers who used bicycles to transport seedlings or carried them on the head from the nursery to their respective planting sites. It was equally reported to be time consuming.

Non- contract farmers also experienced similar problems in the process of acquiring seedlings because most of them relied on the contract farmers in order to acquire tree seedlings to plant.

Despite the problems associated with the use of the tractor, there was still a general agreement among farmers interviewed that the introduction of the tractor improved the level of acquisition. They reported that for the first time since the programme was introduced in the area, farmers who lived further away from the nursery site were able to acquire more tree seedlings than in the seasons prior to 2005 when there was no tractor. Nonetheless, the extent of improvement could not be established. The tractor particularly addressed the problem of poor distribution by making seedling available to farmers who lived further away from the central nursery. It, therefore, demonstrates how availability of resources can enhance farmers' performances (Thompson, 1967

cited in (Alila), 1978). The introduction of the central nursery also improved acquisition by making tree seedlings available. The approach transferred the responsibility of nursery preparation from farmers to the company. It thus underscores the extent to which inadequate labour supply required for nursery preparation can negatively affect the level of acquisition.

These findings further demonstrate that there are other factors which are not directly liked to the institutional framework in place yet they can determine the programmes output. They include the amount of resources available to facilitate the production process.

Species of tree seedlings acquired and reasons for preference

BAT prepares approximately 1.5 Million tree seedlings annually for areas under Oyani Leaf Center (Kenya, 2005). In 2005, only two species namely: *eucalyptus (saligna and camaldulensis)* and *grevillea robusta* were raised in the central nursery. The latter was being introduced for the first time in Oyani West and were few compared to *eucalyptus*. Most of the respondents (70 percent) preferred *eucalyptus saligna* to *camaldulensis* (14 percent). The rest (16 percent) took *grevillea robusta*. Their choices were determined by various factors shown in Table 4.5.

Table 4.5 Summary of tree species and salient features that determined preference by the contract tobacco farmers in 2005.

Species of trees available in the BAT central nursery	Some of the positive features considered by farmers interviewed while acquiring seedlings to plant	Some of the negative features considered by farmers interviewed while acquiring the seedlings
1) Eucalyptus *Saligna*	▪ Was available in the central nursery in large numbers. ▪ Takes a shorter time (3-4 years) to grow to maturity. ▪ Burns steadily even when still wet hence suitable for curing tobacco. ▪ Provides good roofing poles ▪ Regenerates naturally when cut.	▪ Destroys soil fertility hence not suitable for croplands ▪ Susceptible to pest attack.
2) *Grevillea*	▪ Does not destroy soil fertility thus can be planted anywhere in the farm. ▪ Produces good timber and firewood at the same time	▪ Was available in the central nursery in small numbers since its seeds are difficult to get. ▪ Doesn't easily regenerate naturally when cut. ▪ Takes long (even 10 years) to grow to maturity.
3) *Eucalyptus Camaldulensis*	▪ Was available in the nursery in large numbers ▪ Takes a shorter time (i.e. 4-6 years) to grow to maturity compared to grevillea. ▪ Suitable for wood fuel ▪ Provides good timber ▪ Easily regenerates naturally when cut	▪ Takes a lot of time to grow to maturity compared to *eucalyptus saligna* ▪ Destroys soil fertility hence not suitable for cropland

Source: Summarised from the Field Data, 2005.

Most of the respondents acquired *eucalyptus* species in large numbers compared to *grevillea* mainly because it takes a shorter time, often four to five years, to grow to maturity. Farmers indicated that *grevillea* can take almost ten years to grow to maturity. This was captured when one of them said that.

> I planted some *grevillea* species when I was still in primary school and they took almost ten years to grow to maturity. This is why I strongly believe that many tobacco farmers did not take them in large numbers. Usually people prefer to plant species of tree that takes a shorter time to be ready for use.

Some farmers also reported that they acquired certain species especially *eucalyptus* just because they did not have other choices of species to pick from. Non-contract farmers also gave similar reasons.

The observation on time is consistent with the findings of Bradley et al, (1993); Scherr, (1995); and Kweyuh (1997). They note that some farmers prefer species of trees which are able to serve several purposes; unable to interfere with the soil fertility; and grow fast so that they can benefit from them within a shorter time. This was further confirmed when farmers attributed the dominance of *eucalyptus* species in the reforestation programme mainly to the fact that unlike other species, it grows fast besides being used for several purposes. It also confirms the argument advanced in the theoretical framework on how peoples' perceptions about the functions of trees influence how it translates into their daily activities more so in allocating resources (Hafstad, 1987. cited in Omosa, 1987).

The choice of *eucalyptus* due to its suitability for building material was due to high demand for both poles and timber. It was occasioned by a shift by people in the area from grass thatched mud walled dwelling houses to semi-permanent structures with corrugated iron sheet roofs. Farmers attributed the shift to two main factors. First, the general desire by the people in the area to live in better houses. Two, the scarcity of grass needed for thatching and the high cost of maintaining such structures. It was done almost on a yearly basis before and after the long heavy rains. Farmers therefore regarded having semi- permanent structures as an improvement in shelter, improved status resulting in a boost of self esteem, a sign of achievement and reduction of the cost of maintenance in the long term.

Farmers who chose *eucalyptus* on the grounds that it provided good wood fuel required to cure tobacco leaves argued that unlike other types of trees, a huge log of *eucalyptus* tree can be easily split into smaller pieces to be used for curing. It also provides a steady flow of heat even when it is wet. They pointed out that these two qualities are necessary during curing[1] especially for good tobacco grades to be

[1] Curing is the process of drying chlorophyll decomposition and natural chemical changes that result in the desired tobacco product. It takes place in a large tight burn in which temperature and humidity are

obtained. This view partly confirms findings by Kuepper et al (2001) that the quality of tobacco grades mainly depend on how curing is done. The implication is that poor curing of tobacco leaves can be as a result of poor quality of wood fuel used.

Even though many farmers interviewed indicated that they preferred *eucalyptus*, the dominance of the species in the reforestation programme still needs to be reconsidered. Various studies (San Francisco, 1997 and Chapman, 1997) indicate that it interferes with the fertility of the soils where it is planted by withdrawing a lot of water. It thus poses potential threat to food crop production in an area where it is the dominant species like in the case of BAT reforestation programme in Oyani West. Many respondents were also in agreement with this observation. They reported that they did not plant the species on their crop lands for the same reason.

4.4 Planting of Acquired Seedlings

This section examines the extent to which contract farmers planted the tree seedling acquired in 2005. Specific issues examined include: the type and availability of labour used to plant the tree seedlings acquired; farmers' compliance to the target set by the company; and the objective of the company's reforestation programme *vis* a *vis* farmers' reasons for planting trees under the programme. The key hypothesis was that the number of tree seedlings planted increased with level of labour supply.

Type and Availability of Labour Required to Plant Tree Seedlings

Farmer interviewed used four different types of labour to plant tree seedlings acquired in 2005 as shown in Table 4.6: family members (50 percent), both hired labour and family members (35 percent), hired labour (10 percent) and bonded labour (5 percent).

carefully controlled, usually through the use of ventilation and artificial heat (Kuepper et al, 2001). In the case of flue cure, the green tobacco leaves must be kept under high temperature by a circulated heat for about a week (Chapman, 1997)

Table 4.6: Types of labour used by contract farmers to plant tree seedlings acquired in 2005.

Type of Labour	Frequency	Percentage
Family members	25	50
Both family and hired	17	35
Hired	5	10
Bonded	3	5
Total	**50**	**100**

Source: Computed from the Field Data, 2005.

Farmers who used family members indicated that they did not have adequate financial resources to hire labour. Family members were, therefore, both readily available and affordable in their case. Nonetheless, they were still for the idea that tree planting is easier to handle with hired labour. Those who used both hired and family labour indicated that they had a lot of work to be done, mainly attending to tobacco related activities, which could not be managed by family members only. Farmers who used only hired labour indicated that they did not have members of family to engage. They were occupied else where. Those who relied on bonded labour were operating on groups. They worked on each others farm in turns. Their main reason was lack of enough financial resources to hire adequate personnel. Similar observations were also made with regard to the non-contract farmers.

Farmers interviewed were categorical that labour required to plant trees was not readily available. The shortfall in labour supply was mainly due to the fact that most of the labour available was deployed to tobacco production. Farmers blamed lack of labour on the time when the company distributed the seedlings for actual planting. They said that it was not the best period because they already had many activities being undertaken. They included curing tobacco leaves, attending to food crops, looking after livestock among others. It was also pointed out that the curing stage, unlike other stages of the crop's production, requires a lot of labour and undivided attention. One of such requirement is the provision of adequate wood fuel, and constant monitoring of the flow of heat in order to ensure that the right amount of heat is supplied through the curing furnace to avoid incidences of curing burns bursting

into flames. This was apparent in one of the respondent's statement that: "I could not plant all the seedlings acquired since I was just alone yet I was expected to attend to my tobacco production, food crops and livestock at the same time". The situation was aggravated by cultural beliefs among farmers from Luhya community where female members of households were not allowed to plant trees hence leaving the responsibility to men only. Most of them were from *Mwache* area which is predominantly inhabited by members of the Luhya community. As a result, there was a section of labour, among members of this community, which was available but was not put to use. The observation further supports the argument raised in the theoretical framework on how socio-cultural perceptions can undermine a tree planting programme. Contract tobacco farmers, therefore, often chose to give priority to tobacco production at the expense of tree planting.

These observations support the position advanced by Bradley et al (1993) and Kweyuh (1997) on the extent to which inadequate labour supply can be an obstacle to tree planting under reforestation programme. The fact that many farmers in Oyani (40 percent) still cited the problem of lack of labour as the main obstacle to tree planting means that the introduction of the central nursery approach by the company had so far mainly succeeded in solving the problem of inadequate labour required for nursery preparation. It transferred the responsibility from farmers to the company. The responsibility of planting the acquired seedlings, therefore, still remained on the farmers' side.

Farmers interviewed attributed the choice of priority to the opportunity costs involved. They said that both tobacco and food production often give returns within a shorter time in addition to having a higher economic value. In their views, trees take long before their benefits are realised besides having low economic value. Their position reflects a statement in a report by San Francisco (1997) that: "the economic incentives provided by the tobacco companies make tobacco an irresistibly profitable commodity, especially for poor farmers". A similar justification is given by South-gate (1988) cited in Chapman (1997). He argues that the tendency not to adopt conservation measures like tree planting can be partly attributed to the price signals that cause the short term economic sacrifices individual farmers associate, for instance, with soil erosion control to exceed the present value of the future benefits of

soil conservation. The findings further confirm the significance of the timing of nursery preparation when tree planting is undertaken alongside tobacco production.

Planting of the Tree Seedlings Acquired and Meeting the BAT Target

Half of the respondents (50 percent) reported that they did not plant all the seedlings acquired from the central nursery in 2005. About 30 percent were abandoned, 15 percent sold to others, 25 percent gave to others, either to non- contract tobacco farmers or friends, for free. This particular reason reflects North's (1990) argument on informal institutions and how it shapes interactions in a society. The remaining (10 percent) were reported to have been stolen. There was a sharp contrast between contract and non-contract farmers in this case. Whereas contract farmers had seedlings to dispose after planting, there was only one non-contract farmer who did so. Information from the focused group discussion and non- contract farmers interviews attributed this contrast to the fact that non-contract tobacco farmers acquired fewer seedlings to plant.

Apart from not planting all the tree seedlings acquired, a further probe established that only 38 percent of farmers who planted the tree seedlings acquired met the target set by the company in 2005. They planted at least 300 seedlings each. The rest (62 percent) gave the following reasons for failing to meet the target set as shown in Table 4.7: lack of labour (40 percent) and destruction of seedlings in the process of transportation (40 percent). The rest (20 percent) gave other reasons like giving to others, lack of adequate land, sickness, and having some their tree seedling stolen.

Table 4.7: Reasons why some contract farmers did not plant all the tree seedlings acquired in 2005.

Reason	**Frequency**	**Percentage**
Lack of labour	10	40
Acquisition of few seedlings	10	40
Others	5	20
Total	**25**	**100**

Source: Computed from the Field Data, 2005.

The problem of inadequate labour supply was more evident in the fact that 10 percent of the contract farmers interviewed used both family members and hired labour for the production of the crop in 2005. However, this should not be interpreted to mean that farmers who did not use hired labour had adequate labour at their disposal. Some farmers did not hire extra labour mainly due to lack of enough financial resources. The problem of a inadequate labour further supports the observation that the introduction of central nursery only addressed the problem of labour supply required for nursery preparation.

Acquisition of few seedlings resulted from two reasons. First, destruction of seedlings in the process of transportation because of the rough terrain that characterised the road network. This particular observation indicate that apart from the institutional constraints pointed in the theoretical framework, there are other factors like the physical environment, which in one way or another determine how farmers can respond to the reforestation programme. Second, some farmers took few seedlings mainly because that is the number they were able to handle. Nonetheless, even though many contract farmers (62 percent) did not meet the target set by the company, observations during the key informant interviews and focused group discussion still pointed out that the number of seedlings planted in 2005 by each farmer had improved. The fact that farmers interviewed had planted trees with a mode of 300 further supports the observation.

Numbers of trees planted versus labour supply

In order to establish the nature of relation between the number of tree seedlings planted and the labour supply at the disposal of the contract farmers interviewed, the following variables were cross tabulated as shown in Tables 4.8 and 4.9 The number of household members and the number of tree seedlings planted on the one hand; and the level of income and the number of tree seedlings planted on the other hand.

Household size and the number of tree seedlings planted

Lack of labour was the main reason given for not planting all the tree seedlings acquired. However, a cross tabulation of these variables as shown in Tables 4.8 and 4.9 do not show any significant relation that can support the hypothesis. Table 4.8

shows an instance when a household (9 percent) with more than eight members did not plant more than 100 seedlings which was the lowest category of tree seedlings planted in 2005. At the same time there were other households in the same category (17 percent) who planted more than 500 seedlings which was the highest number of seedlings planted in the same year. The same Table also shows instances when 17 percent of households with 1-4 members, the lowest category of members of households, planted more than 500 seedlings, which was the highest number of seedlings planted, in that year. It also shows that a farmer in the same category (8 percent) did not plant any seedling in the same year.

Table 4.8 Household members and the number of seedlings planted in 2005.

Number of seedlings planted contract farmers in the last season	Household size			
	1-4 (n=12)	**5-8 (n=26)**	**>8 (n=11)**	**Total (n=50)**
None	8%	4%		4%
1-100	25%	11%	9%	14%
101-200	25%	27%	9%	22%
201-300		23%	28%	20%
301-400	17%	20%	18%	18%
401-500	8%	11%	9%	10%
>500	17%	4%	18%	10%
Forgotten			9%	2%
Total	**100%**	**100%**	**100%**	**100%**

Source: Computed from the Field Data, 2005

The findings are interpreted to mean that household size did not necessarily determine the number of seedlings planted in 2005.

Total monthly incomes and the number of seedlings planted

Table 4.9 shows an instance when a farmer with the highest level of income (i.e. Ksh 8,000 and above) planted between 101and 300 seedlings. At the same time, there was a farmer in the same category who planted more than 500 seedlings which was the highest range of seedlings planted by farmers interviewed in 2005. The Table also

shows that there were two farmers (7 percent), in the category of the lowest level of monthly income who planted more than 500 seedlings compared to only one in the category of the highest level of income.

Table 4.9 Total monthly incomes and the number of seedlings planted in 2005.

Number of seedlings planted by contract farmers	Total monthly income (Ksh)				
	1-4,000 (n=27)	**4,001-8,000 (n=15)**	**>8,000 (n=7)**	**None (n=1)**	**Total (n=50)**
None	4%	6%			4%
1-100	19%	13%			14%
101-200	26%	21%	14%		22%
201-300	15%	20%	28%	100%	20%
301-400	22%	13%	14%		18%
401-500	7%	13%	14%		10%
>500	7%	13%	14%		10%
Forgotten			14%		2%
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Computed from the Field Data, 2005.

The findings in Table 4.9 show that even though farmers' levels of income played a significant role in planting the acquired seedlings, it did not mean that only farmers who had the highest level of income were the ones who planted the highest number of seedlings in 2005.

Number of seedlings planted versus sizes of land owned

Information from the respondents in Oyani shows that land size was not a problem. Only one respondent said that he did not plant all the tree seedlings acquired in 2005 because of the small size of land. A further analysis (i.e. cross tabulation of farmers' total acreage of land and total number of trees planted in the last season) as shown in Table 4.10 equally shows no relation between the number of tree seedlings planted and the sizes of land owned by farmers. Instead, it shows that there were some farmers (12 percent) in the category of those who had the lowest acreage (i.e. 2-6 acres) of land but still managed to plant between 401-500 tree seedlings. There were

also some farmers (22 percent) who had over ten acres of land but still planted the smallest number (i.e.1-100) of tree seedlings.

Table 4.10: Total land acreage owned by contract farmers and the number of tree seedlings planted

	Total size of land owned by contract tobacco farmers in 2005.			
	2-6 acres (n=25)	**6.1-10 acres (n=26)**	**>10 acres (n=9)**	**Total (n=50)**
Number of tree seedlings planted by contract tobacco farmers	None	4%	6%		4%
	1-100	8%	19%	22%	14%
	101-200	32%	19%		22%
	201-300	16%	19%	34%	20%
	301-400	28%	12%		18%
	401-500	12%	6%	11%	10%
	>500		19%	22%	10%
	Forgotten			11%	2%
	Total	**100%**	**100%**	**100%**	**100%**

Source: Computed from the Field Data, 2005

This is interpreted to mean that the size of land was not the main reason why some farmers did not plant all trees acquired in Oyani contrary to the case of Malawi (TED: Case: 252). Farmers in Oyani still had adequate spaces including alternative planting sites.

Reasons why contract BAT farmers plant trees

The objective of the company' reforestation programme is mainly to guarantee adequate stock of wood fuel and enhance environmental conservation. Findings in Oyani, however, show that there were some farmers who planted trees for other reasons as shown in Table 4.7. Few farmers planted trees mainly to conserve the environment. Half of the respondents (50 percent) planted trees mainly for provision of wood fuel for both tobacco curing and building materials. Those who planted trees mainly for wood fuel provision constituted 18 percent; while 10 percent planted in order to get wood fuel, building materials and income generation. The remaining farmers (20 percent) planted trees for other reasons: wood fuel provision, income

generation, environmental conservation, and provision of building materials. Non contract farmers also gave similar reasons.

Table: 4.11: Reasons why contract tobacco farmers planted trees in 2005.

Reason for planting trees	**Frequency**	**Percentage**
Wood fuel and building material	25	50
Wood fuel provision	9	18
Wood fuel, building materials and income generation	5	10
Others	10	20
Total	**50**	**100**

Source: Computed from the Field Data, 2005.

Even though majority of farmers said that wood fuel provision was their main reasons for planting trees, it emerged during the focused group discussions and key informant interviews that this was a recent phenomenon. The explanation given was that tobacco farmers initially took tree planting for granted due to the availability of natural forest, which was their main source of trees required for the production of the crop. During the interview and discussions, it was reported that some farmers took almost ten years without planting trees under the programme to replace the ones they cut in the course of the crop's production. This observation is similar to the reasons given in three different cases. One, by San Francisco (1997) and TED (Case: 252) for poor response by tobacco farmers to the reforestation programme in both Tanzania and Malawi. Two, the argument advanced by Scherr (1995) on the historical changes in farmer tree growing strategies among members of the Luo community. Three, the argument raised in the theoretical framework on possible negative effects of cultural beliefs on tree planting. In all these cases, poor response to tree planting is mainly attributed to the perception that trees are naturally available hence cannot be depleted.

Understood in the context of North's argument, the findings further underscore the extent to which informal institutions, in the forms of beliefs and perceptions, can act as an obstacle in the reforestation programme. It therefore, supports the explanation given in the theoretical framework. The preceding argument thus partly explains why some farmers took almost ten years to realise the effect of deforestation resulting from the crop's production, like shortfall in wood fuel supply from the natural bushes, and

the subsequent response by establishing their own stocks as observed from 1995. The implication is that farmers left on their own are most likely to take long before embarking on tree planting.

Farmers reported that the demand for building materials in the area was occasioned by the decline in the available indigenous forests that could provide suitable poles and other materials suitable for the construction of either residential houses or curing burns. The situation was aggravated by even higher demands due to a shift by the residents from building traditional huts to semi-permanent structures since the introduction of the cash crop in the area. In addition, the kind of poles required for burn construction, for those who did not use bricks, placed more demand for special type of poles. They could be obtained only from planted trees. The fact that curing burns have to be replaced every one or two years, as pointed out in Malawi, further demonstrates that this demand cannot entirely depend on natural or indigenous forest as the only source of timber (TED Case: 252). Decline in the indigineous trees therefore prompted farmers to start establishing their own stock from the exotic trees.

Farmers further pointed out that the high demand occasioned by decline in the indigenous trees or natural forests subsequently made most of them and even other people in the area to change their perception towards trees. Instead of perceiving trees as naturally available, many people began to gradually acknowledge their economic value. Thus, some people began to plant trees mainly for income generation. Trees became in turn a major a source of livelihood to farmers who did not grow tobacco yet had trees to sell to others. This was ascertained when a further probe established that there were even some people who were not involved in the production of the crop yet were selling their stocks of trees to tobacco farmers in the area. It was source of income. This observation is in agreement with the argument advanced by Scherr (1995) under the induced innovation framework. The central thesis is that there are instances when loss of communal land or restricted access to forests unlike in the case of individual ownership can also motivate the affected persons, farmers in this case, to plant trees. By supporting this position, the findings in Oyani cast doubt on the line of thought that declining farm sizes can be an obstacle to tree planting (San Francisco, 1997; TED, Case: 252).

4.5 Nurturing of the Planted Tree Seedlings

This section examines how BAT contract tobacco farmers managed this particular stage. Specific issues addressed include measures used by farmers to ensure that tree seedlings planted in Oyani grew to maturity; problems or challenges encountered in the course of nurturing and how they were addressed; and how trees grown to maturity were used. The key hypothesis was that farmers who had received extension knowledge on tree planting grew many trees to maturity.

Problems Encountered while Nurturing the Planted Trees

Contract farmers interviewed reported that they experienced a variety of problems in the course of nurturing planted tree seedlings. Apart from two farmers, the rest experienced more than two problems as shown in Table 4.12. These included loss to drought, browsing or disease, pest attack and animal destruction (29 percent); loss of trees to drought (21 percent); pest attack (14 percent); loss to drought and pest attack (12 percent); loss to drought and browsing or disease (10 percent); loss to drought, browsing or disease and pest attack (8 percent); and others (6 percent). Similar problems were also pointed out by the non-contract farmers.

Table 4.12 Problems encountered by contract tobacco farmers in nurturing planted tree seedlings in 2005.

Problem Encountered	**Frequency**	**Percentage**
Loss to drought, browsing or disease and animal destruction	14	29
Loss of trees to drought	10	21
Pest attack	7	14
Loss to drought & pest attack	6	12
Loss to drought & browsing or disease	5	10
Loss to drought, browsing and pest attack	4	6
Others	3	6
Total	**49**	**100**

Source: Computed from the Field Data, 2005.

Loss of trees to drought was mainly attributed poor timing. Farmers said that tree seedlings were ready for planting in May, a period when long rains were almost

ending. Consequently, the transplanted seedlings were not able to withstand or survive the long dry spell that followed immediately after May.

Information gathered during key informant interviews indicate that the situation was further aggravated by two factors. First, some farmers received overgrown seedlings with long taproots, attributed to delay in the distribution and acquisition procedures. There was only one tractor to serve the entire area. Second, planting pits were not properly prepared. According to the District's Assistant Forest Officer, planting pits ought to be prepared at least a month prior to actual planting and according to the recommended size: one foot deep and one foot wide then filled with the right type of soil. The officer stressed that such conditions are necessary for the retention of the required amount of moisture needed to withstand the long dry spell. Despite this, no mechanisms were in place by the company to ensure that planting pits were prepared according to the required standard. According to the Technician In Charge of agro forestry, this could only be possible if the company had adequate resources in place. In his view, one of the implications would be employing more extensions workers for instance technicians and monitors to oversee the process. This was not the case. This observation also underscores the significance of resource availability in the implementation of rural extension agriculture as pointed out by Alila (1978). Some of the problems could have been avoided if there were adequate extension service provided to farmers.

The problem of pest attack on trees occurred immediately the tree seedlings were transplanted. The affected farmers reported that most of their trees were attacked at the roots, followed by gradual withering of the whole plant. A random check by the researcher confirmed the claim. Cases of browsing and disease were reported in both young and mature trees. Farmers pointed out that these two problems were prevalent in 2005. Some farmers were experiencing these problems for the first time since the inception of the programme. The problem of destruction of tree seedlings by livestock affected farmers who did not fence their newly planted tree seedling. They blamed it on the free-range method of keeping livestock in the area. It exposed newly planted seedlings to high rates of mortality. These observations are similar to the ones recorded by Bradley et al (1993); Scherr (1995); and Milimo (1989) in Kisii and Kakamega Districts; former Siaya and South Nyanza Districts; and Loruk

respectively. In all these cases, there is an agreement that agroforestry is associated with risks like loss of trees to drought, browsing or disease, pest attack and animal destruction.

Responses to the problems encountered in nurturing the planted tree seedlings

Even though some of these problems encountered could be easily averted for instance through constant weeding and watering, spraying with insecticides or pesticides and fencing, information obtained show that little was done to address the problems like in the case of Kisii (Bradley et al, 1993). Out of the contract farmers interviewed, over half (57 percent) admitted having done nothing. The remaining (43 percent) took the following actions as shown in Table 4.13: spraying with chemicals (10 percent); fencing in order to keep animals away (10 percent); weeding and mulching (7 percent); spraying, fencing and watering (4 percent); spraying and watering (2 percent); and informing the Field Technician (2 percent). Non-contract farmers also responded in the same way.

Table 4.13: How the affected contract tobacco farmers responded to the problems encountered in nurturing trees in 2005.

Response	**Frequency**	**Percentage**
No action was taken	28	57
Cases where action was taken	21	43
Total	**49**	**100**

Source: Computed from the Field Data, 2005.

Farmers attributed poor response to cases of drought, by watering, mainly to the cost involved. Many residents relied on donkeys to collect water particularly during planting when it was needed in big quantities mainly because of the sparse distribution of the main water points and rough terrain in some parts of the area. As a result, farmers who wanted to water their trees consistently required adequate labour supply to fetch water. Farmers who did not have means of transporting the quantity of water required from particular points to the planting sites therefore had to pay cost of transportation. Since tobacco planting also required a lot of water and was done under the same conditions, farmers reported that most of them ended up using additional

resources to get adequate amount of water for planting. This was compounded by the fact that planting of tobacco seedlings preceded tree planting by about four months. Tree planting was, therefore, done at a time when some farmers had used most of their limited financial resources to plant tobacco seedlings and other related activities. Non-contract farmers also made similar observation. It underscores the relevance of proper timing in a situation whereby reforestation is undertaken along side tobacco production or an activity which equally demands labour supply.

Most of the farmers who responded by spraying in the case of pest attack used ethane provided by the company specifically for spraying tobacco leaves. They did so because the company had not provided them with any specific chemicals for the trees. The one who responded by alerting the company indicated that he did so because he could not manage the disease that had attacked his trees. The company in turn responded by taking a sample to KEFRI to determine the nature of the disease. By the time of the study, the company had not come up with any specific intervention and was still waiting for the findings from KEFRI.

Information gathered from the key informants and other participants attributed poor response by farmers to the problems encountered to lack of adequate measures by the company and farmers to address them. According to farmers, the company had not taken any initiative to build their capacity on extension knowledge. This was also evident from the fact that 84 percent of the respondents admitted not having received any extension service like training on agro forestry from the company since inception of the reforestation programme in the area. The rest (16 percent) had received extension knowledge from other sources. They included Chief's '*Barazas*', workshops organised by DANIDA and other public functions like Agricultural Shows and Field Days, which were only organised once in a while. Unlike contract farmers non of the non-contract farmers had not attended any tree on tree growing.

The company only organised three meetings commonly referred to as farmers' *barazas.* They were at the beginning, in the middle and towards the end of the production season every year. The *barazas* were meant to brief farmers on what is

required of them with respect to tree planting and tobacco production. Farmers, however, found these efforts inappropriate for the dissemination of extension knowledge on tree planting. They pointed out first, that the *barazas* were biased towards issues specific to tobacco production like grading, pricing and loan application. Second, they felt that the amount of time allocated to the Technician In Charge of agroforestry was limited. Consequently, only few issues like nursery site selection, preparation and transport arrangements for the seedlings were discussed. This is unlike Kisii and Kakamega where farmers' trainings were continuous, well organised and more focused in terms of objective (Bradley et al, 1993).

It is also evident that extension services for tree planting was not allocated adequate resources in relation to tobacco production, which is the company's core activity. Whereas there were fourteen Leaf Technicians employed by the company to oversee the production of the crop, there was only one Field Technician to oversee the reforestation programme in the entire area. Furthermore, whereas the Technician In charge of Agroforestry was a Diploma holder, most of the Leaf Technicians were graduates.

Extension knowledge versus responses to the problems encountered

A cross tabulation of farmers' extension knowledge and their responses to the problems encountered while nurturing trees planted in Table 4.14 shows some positive relation between the two variables. The Table shows that majority of farmers (65 percent) who reported that they had not attended any training on agroforestry did not respond in any way to problems encountered while nurturing trees planted under the company's programme. On the contrary, it is the majority (above 63 percent) of farmers who reported to have attended training on agroforestry who also happened to have responded, in different ways, to problems encountered in the process of nurturing trees.

Table 4.14: Farmers' access to extension knowledge and responses to the problems encountered

Attendance to seminars on tree planting in 2005.

Response of farmers to the problems encountered by farmers while nurturing trees planted	Yes	No	Total
No action taken	37%	65%	60%
Cases where action was taken	63%	35%	40%
Total	**100%**	**100%**	**100%**

Source: Computed from the Field Data, 2005.

Farmers who did not respond in any way blamed the company for failing to provide them with extension services. In their view, the company gave priority to tobacco production in terms of resource allocation.

Available information indicates that farmers under the KWDP were able to respond adequately to problems they encountered while nurturing trees planted under the programme mainly because they were well trained and equipped before the implementation of the programme (Bradley et al, 1993). This observation further underscores the significance of extension knowledge in nurturing planted trees to maturity.

Planting Sites

Apart from lack of extension knowledge, most of the trees acquired in Oyani had little chances of growing to maturity because they were planted in risky sites as shown in Table 4.15. A study by Bradley et al, (1993) shows that planting sites can influence the performance of planted trees. The study shows that trees planted on croplands perform better than the ones planted on wood lots and hedges mainly because of frequent weeding and fertility of cropland. Trees planted on hedges and boundaries are also shown to perform poorly mainly due to heavy competition of weeds and shading; while trees planted in wood lots perform poorly mainly due to infertility of such sites. Farmers often establish wood lots on steep, waterlogged and stony sites.

In Oyani, trees planted on wood lots constituted 46 percent, 22 percent were planted on hedges, 22 percent on boundaries, 6 percent planted on both hedges and boundaries while the rest (4 percent) were planted on both wood lots and hedges. The same applied to non-contract farmers.

Table 4.15 Sites where acquired seedlings were planted in 2005.

Planting Site	**Frequency**	**Percentage**
Woodlots	23	46
Hedges	11	22
Boundaries	11	22
Hedges and boundaries	3	6
Woodlots and hedges	2	4
Total	**50**	**100**

Source: Computed from the Field Data, 2005.

Several factors influenced the choice of sites. Wood lots were chosen in order to separate trees from food crops and to avoid destruction of soil fertility in the cropland. A further investigation found out that most of the wood lots were established in infertile, waterlogged and stony or hilly sites. Other reasons given included having many seedlings to plant, lack of alternative planting sites and the belief that trees grown in wood lots provide better building materials especially for roofing unlike the ones grown in isolation, which have thick trucks.

Farmers who planted their tree seedlings on the boundaries and hedges gave the following reasons: lack of enough piece of land and the need to mark boundaries or reinforce the existing ones in order to avoid cases of neighbours altering boundary lines by replacing sisal marks (a common in the rural areas where land disputes are prevalent). The other reason was to avoid the destruction of soil fertility in the croplands. Reasons for choosing hedges included wind breaking and provision of shades. These findings show that even though the choice of planting sites varied with farmers and for different reasons, they also posed many threats to the performance of planted trees.

Trees Grown to Maturity and their Uses

Information obtained from the respondents indicated that, even though the company introduced reforestation programme in the areas in the early 1980s, only few contract non-contract tobacco farmers had grown trees to maturity under the programme. Trees grown to maturity had a mean of 300; mode of 350; and a range of between 100 and 1000. Farmers attributed the situation to failure of some contract tobacco farmers to plant trees under the programme and high mortality rate of the planted trees as a result of poor nurturing. The case of high mortality further supports the argument on the high risk associated with agroforestry either due to the planting site or other external factors as pointed out by Milimo (1989) and Bradley et al (1993).

Some of the trees grown to maturity were also not used as required by the company. Some were used to construct dwelling houses while others were sold in order to generate income. Some farmers attributed it to lack of follow-ups by the company to ensure that trees grown to maturity were only used for the intended purpose(s). Despite this observation, one of the officers was categorical that this would be difficult to implement mainly because of the complexities involved and the resources that would be required. He also noted that the company did not have adequate grounds to compel farmers to use trees planted under the programme only for a particular purpose given that farmers have the rights to use trees they have grown to maturity the way they want.

4.6 Management of Wood fuel for Tobacco Curing

One of the objectives of the BAT reforestation programme is to provide wood fuel for curing of the crop. This section, therefore, examines how contract tobacco farmers managed wood fuel needed for curing. Specific issues addressed are acquisition of wood fuel for curing; and cases of shortfall in wood fuel supply and the coping mechanisms. The key hypothesis was that contract tobacco farmers with the highest level of monthly income responded to the problem of shortfall in wood fuel supply mainly by purchasing wood fuel from other sources.

Acquisition of wood fuel for tobacco curing

In 2005, farmers interviewed relied on the following three sources of wood fuel to cure their tobacco as shown in Table 4.16: own stock (40 percent), purchase (28 per cent), and both own stocks and purchase (32 percent). The same applied to non-contract farmers.

Table 4.16: Sources of wood fuel used for tobacco curing in 2005.

Source of Wood fuel	**Frequency**	**Percentage**
Own stock	20	40
Purchased	14	28
Both	16	32
Total	**50**	**100**

Source: Computed from the Field Data, 2005.

Farmers who relied on their own stock acquired it either from their planted exotic trees or indigenous trees on their pieces of land covered with natural bushes. Most of the respondents reported that whenever they cleared a virgin piece of land for cultivation, they gathered wood fuel and kept it for tobacco curing. Purchased wood fuel was obtained from other sources, mostly non-tobacco farmers who had adequate stock of either indigenous or exotic trees. They sold part of it in order to generate income. Before the introduction of the crop in the area, people only used to purchase trees to build dwelling houses. Thus, wood fuel was purchased either due to inadequate or complete lack of own stock for curing. Similar observations were also made by non-contract tobacco farmers.

The findings imply that tobacco farmer did not necessarily require to have their own stock of trees for wood fuel in order to grow the crop. This could also induce some of them from growing the trees under the company's programme.

Besides sources of wood fuel, farmers interviewed also used different types of wood fuel in 2005. Those who used both indigenous and exotic species constituted 48 percent; 30 percent used only indigenous species while 22 percent used exotic species as shown in Table 4.17.

Table 4.17: Types of wood fuel used by some contract tobacco farmers in 2005.

Types of wood fuel	Frequency	Percentage
Both Indigenous and Exotic	18	48
Indigenous	11	30
Exotic	8	22
Total	**37**	**100**

Source: Computed from the Field Data, 2005.

The transition from use of only indigenous to use of both indigenous and exotic trees was mainly attributed to decline of indigenous trees. Since the crop was introduced in Oyani, many farmers had cleared natural bushes covering large tracs of land either for the crop's cultivation or to obtain wood fuel for tobacco curing without necessarily replacing trees cut in the process.

Experiences of shortfall in wood fuel supply and coping strategies

The attempt to investigate how farmers cope with shortfall in wood fuel supply was based on the premise that tobacco farmers who did not replace trees they cut during production were bound to experience a short fall in wood fuel supply. Such a scenario was further envisaged to prompt two possible responses. The affected tobacco farmers either opt out of the production process or they adopt a coping strategy to account for the shortfall.

Both contract and non-contract farmers interviewed were in agreement that the problem of shortfall in wood fuel supply was a reality. Almost one half (48 percent) of contract farmers admitted having experienced cases of shortfall in the course of the crop's production. They attributed the problem mainly to the following factors. First, indiscriminate felling of trees or clearing of natural bushes either to get wood fuel for curing or for other tobacco related activities, without a corresponding level of replacement. The belief that trees are naturally available was still pointed out as the main cause, which is akin to one of the arrangements raised in the theoretical framework. Second, the need to clear land for cultivation as the number of those who depend on agriculture increases in the rural areas among others. Similar experiences have also been reported in other tobacco growing countries like Tanzania, Zambia,

Malawi and other developing countries (Geist, 1998; Geist, 1999). The findings point to the fact that the problem of shortfall in wood fuel supply is a common phenomenon hence was not unique to only tobacco farmers in Oyani.

In order to demonstrate their experiences of shortfall in wood fuel supply, the affected farmers pointed out some of the changes. They include changes in the sources and types of wood fuel used; time, means of wood fuel acquisition; size, numbers of both curing burns and farmers using them; acreage of land under tobacco production; and the level of consistency with the production seasons. Farmers who reported that they bought wood fuel from other sources constituted 38 percent while 33 percent reduced the sizes of their curing burns. Those who reduced both the size and number of curing burns constituted 8 percent while another 8 percent also reduced the number of the curing burns in addition to buying wood fuel. The rest (13 percent) adopted other measures as shown in the Table 4.18.

Table 4. 18: Responses to shortfall in wood fuel supply in 2005.

Response	**Frequency**	**Percentage**
Purchasing wood fuel	9	38
Reduction of the size of the curing burn	8	33
Reduction of both size and number of curing burns	2	8
Reducing number f burns and purchasing wood fuel	2	8
Others	3	13
Total	**24**	**100**

Source: computed from field data, 2005.

Due to the shortfall in wood fuel within the locality, some farmers had to look for wood fuel from as far as 30 kilometres hence a change in the mode of acquisition. Those who acquired wood fuel from far distance had to use either tractors or lorries while unlike in the past, most of those who still gathered wood fuel within the locality used oxen cart and wheelbarrows to move them to the curing site. Unlike in the previous seasons when wood fuel could be easily obtained from the locality, farmers used additional financial resources to purchase and transport them to the curing sites in 2005. This, in their view, increased the cost of production.

Some ecological changes had also started becoming evident in the area. For instance, during the focus group discussions farmers made the following observations: drying up of some seasonal streams in the area and changes in the weather patterns particularly with regard to rainfall. They attributed both occurrences to the interference with the vegetation cover in the area due to the massive felling of trees without corresponding replacement.

Farmers who reduced both sizes and numbers of curing burns reported to have shifted from using two curing burns to one. Some of them reduced the sizes of their curing burn (s) from the company's recommended size of six steps measuring 3 feet wide, 15 feet long and 16 feet high to their preferred size: mostly five steps measuring 14 feet wide, 13 feet long and 15 feet high (BAT, 2005). They also opted to fit their curing burns with the *venturi* furnace. It was noted that improvements in burn construction enhanced the quality of tobacco produced in addition to the reducing the level of wood fuel consumption. Many of them reported having produced better grades due to efficient loading and adequate heat circulation. This observation is consistent with Geist's (1997) position that high rate of wood fuel use can be considerably reduced by investing in furnace technology, burn construction and efficient loading. The adjustments also had negative effects. Farmers had to reduce the acreage of the crop in their farms to a level that could be accommodated in the adjusted burns. Those who did not reduce their acreages had some of their tobacco leaves got spoilt in the farms because of delay in curing. They produced more leaves than the capacity of their curing burns.

The number of days required for curing tobacco leaves also reduced significantly from 7 days prior to the changes to 4 days after the changes pointing improved efficiency. This ultimately reduced the amount of wood fuel required for curing in a season. There were also instances when some of the respondents increased the number of farmers who were using their curing burns. They did so in order to get additional labour supply and to have additional source of wood fuel. Every burn user was required either to bring a given amount of wood fuel or pay for it in cash depending on the quantity of tobacco leaves to be cured.

A point to note is that whereas the respondents effected different changes, they still fall in two major categories mainly on the basis of the timing. Changes effected upon realising shortfall in wood supply were responses to the problem of shortfall hence coping strategies. They enabled affected farmers to remain in tobacco production. Changes introduced purposively to avert possible shortfall in wood fuel supply, were more of preventive measures. The interpretation is that any tobacco farmer can experience shortfall in wood fuel supply. Whereas the problem can also be prevented, there are also various ways of responding to the problem in the event of a shortfall. Thus, the problem did not necessarily lead to farmers' exit from the crop's production.

Farmers' responses versus their total monthly income

In order to establish whether farmers' responses were determined by their levels of income, two variables were cross tabulated as shown in Table 4.19. The analysis indicates that even though majority of the respondents opted for purchasing wood fuel from other sources, it was not particularly dominated by those who had the highest monthly income even though they required financial resources to do so. On the contrary, none of the farmers in the category of those who had the highest level of income (i.e. above Ksh 8000 per month) responded to shortfall in wood fuel supply by only buying wood fuel. Instead, 50 percent of farmers in this category reduced sizes of their curing burns. Those who responded by reducing both the size and number of curing burns constituted 25 percent while the other 25 percent also responded by increasing the number of burn users as well as buying wood fuel. It was the majority of farmers in the category of the lowest level of income (67 percent) who responded to shortfall in wood fuel supply by buying wood fuel. The rest responded by reducing the size of curing burns (11 percent); reducing both the number of curing burns and buying wood fuel (11 percent); and by increasing the number of burn users, reducing the size of curing burns and skipping seasons (11 percent).

Table 4.19 Responses to shortfall in wood fuel supply and farmers' levels of income

Farmers' responses to shortfall in wood fuel supply	Farmers' total monthly income (Ksh)			
	1-4000 (n=9)	4001-8000 (n=11)	>8000 (n=4)	Total (n=24)
Buy wood fuel	67%	27%		38%
Reduce size of burn	11%	45%	50%	34%
Reduce size and number of curing burns		9%	25%	8%
Increase number of burn users, reduce size and number of burns; and buy wood fuel		9%		4%
Reduce number of curing burns and buy wood fuel	11%	9%		8%
Increase number of burn users, reduce size of burn and skip seasons	11%			4%
Increase number of burn users and buy wood fuel			25%	4%
Total	**100%**	**100%**	**100%**	**100%**

Source: Computed from the Field Data, 2005.

From these observations, it can be concluded that even though majority of farmers who had experienced shortfall in wood fuel supply opted to purchase wood fuel to address the problem, this particular choice was not limited to only farmers with the highest level of income. It would seem that the amount of wood fuel needed to account for the shortfall was still affordable to farmers. The second explanation is the fact that farmers who did not have cash money to buy wood fuel could still get the amount of wood fuel they wanted on credit and settle the debt after getting money from tobacco sales. In any case the amount of money farmers got from the crops production was more than what was required to purchase wood fuel. This is further interpreted to mean that failure to experience shortfall in wood fuel supply in the case of tobacco farmers in Oyani did not necessarily imply a better response by farmers to the company's reforestation programme.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of the Findings

Distribution and Acquisition of Tree Seedlings

There was before 2005 poor distribution and acquisition of tree seedlings mainly due to the individual farmer nursery approach. The situation improved in 2004/2005 production season mainly due to the introduction of a central nursery approach and the tractor for transportation. The central nursery approach transferred the responsibility of nursery preparation from farmers to the company. Seedlings were therefore readily available in the nursery and overall farmers who previously failed to raise their own nurseries received seedlings. The tractor also enabled farmers who live a distance away from the nursery site to acquire seedlings. The distance between the central nursery and farmers' actual planting sites was therefore not a major constraining factor in acquisition. Nonetheless, some problems were still experienced. They included limited variety of tree seedlings species, rough terrain that characterised the areas road network, delayed transportation and poor organisation at the collection sites.

Planting of seedlings acquired and compliance to the target

Farmers were in agreement that there was an improvement in the number of trees planted in 2005 compared to the previous years. Farmers attributed this to the following two main reasons: a) improved distribution and acquisition, which enabled farmers who lacked tree seedlings in the previous seasons to have seedlings in 2005 b) farmers increasingly appreciating the effects of deforestation resulting from the production of the crop and the need to respond by planting trees. However, it was also established that some farmers took long to begin planting trees mainly due to the beliefs that trees are naturally available thus cannot be depleted. Even though majority (60 percent) of farmers did not meet the target set by the company of planting 300 seedlings in 2005, farmers were putting effort towards achieving the target. Failure to meet the target was attributed to two factors: lack of adequate labour and acquisition of inadequate seedlings. The improvement in distribution arrangement aside, not all the tree seedlings acquired were actually planted contributing to failure to meet the target set by the company.

Nurturing of Planted Tree Seedlings

Risks associated with planting trees included loss to drought, disease and pest attack, browsing and animal destruction. Planted trees were therefore exposed to high mortality rate. The situation was compounded by lack of proper response by both farmers and the company. There were no adequate extension services. Some of these trees did not, therefore, grow to maturity. The study also established that not all trees that grew to maturity were used in line with the objectives of the programme of tobacco curing. Instead, some of them were sold while others were used to construct dwelling houses.

Management of Wood Fuel for Tobacco Curing

Farmers relied on different sources to obtain wood fuel for curing. Most of them used both indigenous and exotic trees. There was also a gradual shift from using indigenous trees only to use of both exotic and indigenous trees. Farmers did not necessarily have to rely on their own stock to get wood fuel for curing. Some of them purchased wood fuel from other sources. The main cause of shortfall was decline of indigenous species of trees due to wanton destruction of trees without corresponding replacement. Farmers who experienced shortfall in wood fuel supply responded through various coping mechanisms. Even though many of them responded by purchasing wood fuel, it was not limited to only farmers with high levels of income as it was hypothesised.

5.2 **Conclusions**

The performance of reforestation programme in Oyani depended on how acquisition, planting and nurturing of the planted tree seedlings were done. The study shows that distribution and acquisition of tree seedlings is a function of several factors. They include the nursery arrangement, timing of nursery preparation, the species of seedlings available for collection and resources made available by the company. Proper timing is required to avoid clash in terms of labour demand and to ensure that tree seedlings are ready for planting when there is adequate rainfall. It is also evident from the study that many sources of tree seedlings enhance acquisition in the event that they have different varieties of seedlings and are affordable. Therefore, it is necessary to involve farmers in determining the timing of the nursery preparation and selecting the species to be planted under the programme. In other words, there is a

need to involve farmers in the conceptualisation, design and implementation of such a programme. The study further shows that distance is not a key determinant of the level of acquisition especially where there is a motorised means of transportation especially to carter for farmers who live far from the site. It may however be an issue where there are no such arrangements for transportation.

Farmers do not all through depend on their own stock of trees to obtain wood fuel to cure their tobacco as some of them often they buy from other farmers who are willing to sell some of their stocks of trees. Most of those who sell trees for tobacco curing are not tobacco farmers. This was found to discourage farmers from establishing their own stock of trees as required under the reforestation programme.

A shortfall in wood fuel supply is a reality likely to affect virtually every farmer for which two options are open to farmers. A farmer can choose to adopt preventive measures notably planting own trees to avoid experiencing shortfall or wait till shortfall occurs then respond by effecting various coping mechanisms. The choices of coping mechanisms are well within the reach of every farmer. Also the fact that some farmers purchase wood fuel from other sources means that failure to experience shortfall in tobacco production does not necessarily mean better response to the programme.

Lastly, apart from the institutional constraints as argued in the theoretical framework, the study findings show that there are other factors like the physical environment, resource availability among others, which in one way or another determine how farmers can respond to the reforestation programme

2.3 Recommendations

The following recommendations should be considered in order to improve BAT tobacco farmers' response to the company's reforestation programme and also in situations similar to Oyani.

Distribution and acquisition of tree seedlings

There is need to come up with a policy making framework which incorporates all stakeholders notably farmers in the decision making process. For instance, farmers

should be involved in determining the type of species of trees to be planted and the timing of the nursery preparation. There is also need to investigate the possibility of more varieties of tree species to provide farmers with a range of attractive choices from which to pick.

The company should consider increasing the number of central nurseries in Oyani instead of relying on one. They should be spread out in different parts of the area in order to avoid problems associated with transportation of seedlings to farmers. If only one central nursery continues to be in operation, the company should deploy more tractors or lorries to enhance distribution. It would also help in addressing problems of delay in transportation of seedlings and destruction of seedlings in the course of transportation due to the rough terrain. Farmers should be encouraged to raise their own individual nurseries to boost their level of acquisition.

Definite rules and regulations are also needed to ensure that tobacco farmers acquire the number of seedlings they are able to plant so that tree seedlings are not abandoned after acquisition. Better organisation at the collection point would ensure that nobody or group has an undue advantage over the other while acquiring seedlings to plant. Like contract farmers, non-contract farmers should also be encouraged to acquire seedlings directly from the central nursery.

Planting of tree seedlings acquired and compliance to the target set

Timing of nursery should be changed in order to ensure two things: a) avoid clash over labour demand between tobacco production and tree planting; and b) ensure adequate rainfall required for both tree planting and nurturing. Most of the farmers proposed the period between the months of September and November. The company should also sensitise farmers on the need to plant trees. Farmers who are successful in the reforestation programme can be involved in training others. The company also requires practical sanctions to punish farmers who fail to comply with the rules set once an enabling environment is created.

Nurturing of the planted tree seedlings and wood fuel management for tobacco curing

The company should address the challenges experienced in nurturing by improving the extension services and educating farmers on the ecological benefits of trees. The problem of shortfall in wood fuel supply can also be addressed by intensifying tree farming in the Area. This can be realised by establishing new woodlots independent of the ones owned by tobacco farmers to complement farmers' efforts.

5.3 **Areas for Further Research**

The following areas are recommended for further studies:

a) The effects of the reforestation programme on environmental sustainability require in-depth investigations since environmental sustainability is one of the objectives of the programme. The study findings indicate that *eucalyptus* is the main species planted under the programme but it undermines soil fertility. An important specific objective of the study would, therefore, be to establish the appropriateness of the species in the reforestation programme.

b) There is also need to undertake a comparative study involving one more company with a different approach to the reforestation programme in the area. A case in point will be a study between the BAT and the Mastermind tobacco companies to establish the nature of variations and to capture other dynamics. Mastermind is suggested on the basis that it has a different timing of nursery preparation. Such a study would therefore, for instance, shed light on the effects of different timing on the outcomes of the programmes.

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APPENDIX 1: QUESTIONNAIRE SCHEDULE FOR CONTRACT AND NON-CONTRACT TOBACCO FARMER

Interviewer .....

Date .....

SECTION ONE: GENERAL INFORMATION

Q NO	QUESTIONS	RESPONSE	CODE
1.	Questionnaire number		
2.	Study location	1. Upper Mwache 2. Lower Mwache	
3.	Type of farmer	1. B.A.T Contract 2. Non Contract 3. Other, specify _____	
4.	Sex of respondent	1. Male 2. Female	
5.	Age of respondent		
6.	Position in the household	1. Mother 2. Father 3. Other, specify _____	
7.	Marital Status	1. Single 2. Married 3. Divorced/separated 4. Widowed 5. Other, specify _____	
8.	Religion	1. Catholic 2. SDA 3. Legio Maria 4. PEFA 5. PAG 6. Other, specify _____	
9.	Level of Education	1. None 2. Primary 3. Secondary 4. Tertiary 5. University 6. Other, Specify _____	
10.	No of House hold members		
11.	Occupation	1. Farmer 2. Secondary school teacher 3. Primary school teacher 4. Business person 5. Other, specify _____	
12.	What is your monthly income (Ksh) from the following sources	a. Farming _____ b. Remittances _____ c. Off-farm business _____ d. Total _____	
13.	How much money did you get		

	from tobacco farming in the last season (Ksh)?		
14.	When did you start growing tobacco (year)?		
15.	When were you contracted by BAT (year)?		
16.	How many curing burns did you use in the last season?		
17.	How many non-contract tobacco farmers are affiliated to you?		
Land ownership and land use practices			
18.	Which year did you obtain these pieces of land?	a. Rental/lease	
		b. Ancestral / Inheritance	
		c. Purchase	
		d. Other, specify_____	
19.	What is the nature of ownership?	1. Rental/lease 2. Ancestral / Inheritance 3. Purchase 4. Other, specify_____	
20.	What are the sizes of these pieces of land you own?	a. Rental/lease (acre)	
		b. Ancestral / Inheritance (acre)	
		c. Purchase (acre)	
		e. Other, specify (acre)_____	
		f. Total (acre)	
21.	In the last season what size of land did you apportion to the following uses?	a. Tobacco farming (acre)	
		b. Tree planting (acre)	
		c. Food crop (acre)	
		d. Livestock keeping (pasture)	
		e. Other uses, specify _____	
SECTION II: DISTRIBUTION AND ACQUISITION OF TREE SEEDLINGS			
22.	Have you ever planted trees since you started growing tobacco?	1. Yes 2. No	
23.	If no, explain		
24.	If yes, where did you obtain tree seedling in the last season?	1. BAT 2. BAT farmers 3. Own nursery 4. Other, specify _____	
25	Why do you plant trees?		
26.	When did you first receive tree seedlings from BAT (year)?		
27.	When did you last receive tree		

	seedlings from BAT (year)?		
28.	What is your view on the time you secure tree seedlings for planting?		
29.	What is the approximate distance between your home and the BAT collection point (Km)?		
30.	How do you move seedlings from the nurseries / collection point to the planting area?	1. Vehicle / Tractor 2. Bicycle 3. Carry on head 4. Other, Specify _____	
31.	Is there any problem experienced in the collection arrangements?	1. Yes 2. No.	
32.	Explain		
33.	What species of trees did you plant in the last season?	1. Eucalyptus 2. Cypress 3. Cedar 4. Other, specify _____	
34.	Are these the species most farmers plant?	1. Yes 2. No	
35.	Explain		

SECTION III: ACTUAL PLANTING OF THE ACQUIRED TREE SEEDLINGS

36.	How many seedlings did you collect when you first participated in the BAT reforestation programme?		
37.	How many did you plant?		
38.	How many seedlings did you collect in the last season?		
39.	How many did you plant?		
40.	In case you didn't plant all the tree seedlings collected please explain why		
41.	Where did you take the remaining seedlings?	1. Abandon 2. Sell to others 3. Give to others 4. Other, specify _____	
42.	Did you meet the BAT target on the number of trees to plant in the last season?	1. Yes 2. No	
43.	If no, explain		
44.	In which part of the farm did you plant the trees?	1) Wood lots 2) Hedges	

		3) Boundaries 4) Other, specify_____	
45.	Give reasons for the choice of the location		
46.	Which type of labour did you rely on to plant the trees in the last season?	1) Family members 2) Hired 3) Both hired & family 4) Bonded 5) Other, specify_____	
47.	If hired, how much money did you use in the last season?		
48.	Since you started participating in the BAT Reforestation Programme how many trees have you grown to maturity?	1. 1 - 200 2. 200 - 400 3. 400 - 600 4. 600 - 800 5. 800 - 1000 6. 1000 & above 7. Other, specify_____	
49.	What risks have you faced in nurturing trees planted?	1. Loss of trees to drought 2. Browsing or disease 3. Pest attack 4. Destruction by animals 5. Theft 6. Other, specify _____	
50	How do you deal with problems encountered?		
51.	Trees you have grown to maturity have been used for what purpose?	1. Wood fuel (domestic) 2. Wood fuel (tobacco) 3. Timber/poles for building 4. For sale 5. Other, specify _____	
52	Explain		
53.	Have you ever attended a training/seminar/workshop on tree planting?	1. Yes 2. No	
54.	Explain		
SECTION IV. SHORTFALL IN WOOD FUEL SUPPLY, CAUSES OF SHORTFALL AND COPING MECHANISMS			
55.	Where do you cure your tobacco?	1. Own curing burn 2. Other farmers curing burn 3. Other, specify _____	
56.	What was the source of wood fuel you used for tobacco curing in the last season?	1. Own trees. 2. Buying from others 3. Both (Buy and own)	

		4. Other, specify _____	
57.	If you bought, how much money did you spend in the last season?		
58	If you used your own what type of trees did you use?	1. Indigenous 2. Exotic 3. Both	
Describe the type of change you have experienced since you started growing tobacco with regard to the following			
59.	Type of wood fuel used for curing tobacco?	1. A shift from indigenous to exotic trees. 2. A shift from exotic to indigenous trees. 3. A shift from indigenous to both. 4. A shift from exotic to both. 5. Other, specify _____	
60.	Explain		
61.	The source of wood fuel used for curing tobacco.	1. A shift from own trees to purchased ones. 2. A shift from purchased ones to own trees. 3. A shift form own trees to both 4. A shift form purchased to both 5. Other, specify _____	
62.	Amount of money used to purchase wood fuel.	1. Increased 2. Reduced 3. Remain constant	
63.	Explain		
64.	Time used to gather wood fuel.	1. Increased 2. Reduced 3. Remain constant	
65.	Explain		
66.	Size of curing burns used since you started growing tobacco	1. Increased 2. Reduced 3. Remain constant	
67.	Explain		
68.	Number of curing burns	1. Increased 2. Reduced 3. Remain constant	
69.	Explain		

70.	Size of land under tobacco farming?	1. Increased 2. Reduced 3. Remain constant	
71.	Explain		
72.	Consistency with seasons (farming without skipping a season)	1. Consistent 2. Inconsistent	
73.	Explain		
74.	The number of farmers using your curing burn.	1. Increased 2. Reduced 3. Remain constant	
75.	Explain		
76.	Have you ever experienced a shortfall in wood fuel supply for tobacco curing?	1. Yes 2. No	
77.	If yes, what is the course of shortfall?		
78.	If yes, what did you do about the short fall?	1. Increase number of non- contract farmers (form clusters) 2. Reduce the size of the curing burn. 3. Reduce the number of the curing burn. 4. Skip seasons 5. Buy wood fuel from others 6. Others (please specify)_____	
79.	If no, what do you do to avoid short falls?		
SECTION V ENHANCING RESPONSE TO THE BAT RE- AFFORESTATION PROGRAMME			
80.	Do you agree that tobacco production causes deforestation?	1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree 5. Don't know / Refuse	
81.	Explain		
82.	How effective is the BAT reforestation programme in	1. Not effective 2. Fairly effective	

	dealing with deforestation problem?	3. Average 4. Very effective 5. Don't know/refuse	
83.	Explain		
84.	If not effective suggest a possible alternative intervention (s) to address the problem of deforestation		
85.	Explain		
86.	Who should prepare / provide tree seedlings to be planted by farmers?	1. Individual farmers 2. BAT 3. Other, specify _____	
87.	Explain		
88.	Which is preferred species of trees to be provided to tobacco farmers by BAT?	1. Eucalyptus 2. Cypress 3. Cedar 4. Other, specify _____	
89.	Explain		
90.	What is the preferred number of seedlings an individual farmer should be required to plant in a season?		
91.	Explain		
92.	When should seedlings be provided for planting (month)?		
93.	Explain		
94.	Who should design the reforestation programme?	1. Farmers 2. BAT 3. Both 4. Other, specify _____	
95.	Explain		
96.	What do you think should be done to ensure that contract tobacco farmers plant trees?		
97.	Explain		

98.	What should be done to ensure that non – contract farmers plant trees?		

APPENDIX 2: INTERVIEW SCHEDULE FOR A FOCUSED GROUP DISCUSSION (CONTRACT FARMERS)

A) INTRODUCTION

The historical, key components and approaches of the BAT reforestation programme.

B) ACQUISITION AND PLANTING OF THE SEED LINGS

1. How do you compare individual and centralized nursery approaches?
2. Are there problems encountered in the collection / reception of seedlings?
3. What are your views with regard to the following: the species of trees provided, the time of provision and the target set by BAT?
4. Are there some cultural norms that have influenced the performance of the BAT reforestation programme?
5. Are there extension services provided by BAT and how adequate are they?
6. Comment on variance in compliance among contract tobacco farmers with regard to the target set by BAT?
7. Are there climate / geographical factors that have influence on the reforestation program?
8. What are the risks a farmer faces in tree planting?
9. How do farmers respond to the risk factors?

C) SHORTFALL IN WOOD FUEL SUPPLY, CAUSES AND COPING MECHANISMS

10. Do farmers experience shortfall in wood fuel supply?
11. What are some indicators of shortfall in wood fuel supply?
12. What causes shortfall in wood fuel supply?
13. How do farmers cope with the shortfall in wood fuel supply?
14. Explain why some farmers don't experience shortfall?

D) ENHANCING LEVELS OF RESPONSE TO THE DAT RE-AFFOESTATION PROGRAMME

15. Can you identify a relationship between tobacco production and deforestation?
16. How effective is the reforestation programme in achieving its intended goal?
17. Is there a possible alternative to the reforestation programme?
18. Who should design the reforestation programme?
19. What should be done to enhance response to the reforestation programme?

APPENDIX 3: INTERVIEW SCHEDULE FOR FOCUSED GROUP DISCUSSION

A) INTRODUCTION

The historical aspects of the BAT reforestation Programme and its key components.

B) PLANTING OF TREES

1. Do non-contract farmers plant trees?

1. Which species of trees do they plant and why?
2. Where do they get the tree seedlings
3. Which period (month) do they plant trees?
4. Why do they plant trees?
5. Why do some farmers plant more trees than others?
6. Where do they plant trees
7. Are there cultural norms that influence non-contract farmers' tree planting habits?

C) SHORTFALL IN WOOD FUEL SUPPLY & COPING MECHANISMS

8. Do non-contract farmers experience shortfall in wood fuel supply?
9. What is the cause of shortfall in wood fuel?
10. How do they cope with the problem of shortfall in wood fuel for curing?

D) ENHANCING RESPONSE TO TREE PLANTING

11. Do you think that tobacco production causes deforestation?
12. What is the best way of addressing the problem?
13. What can be done to ensure that non-contract farmers plant trees?
14. Should the company also give non-contract farmers trees seedlings to plant?
15. What is the preferred species of trees and why?
16. What is the best time to plant and why?

APPENDIX 4: INTERVIEW SCHEDULE FOR KEY INFORMANTS

Name _____

Occupation _____

A) INTRODUCTION

1. The historical, key components and approaches of the BAT reforestation programme.

B) RECEPTION AND PLANTING OF THE SEEDLINGS

1. How do you compare individual and centralized nursery approaches?
2. Are there problems encountered in the collection / reception of seedlings?
3. What are your views on the following:
   (a) The species of trees provided?
   (b) The time of provision?
   (c) The target set by BAT?
4. Have cultural norms influenced the performance of the BAT reforestation programme?
5. (a) Are there extension services provided by BAT? How adequate are they?
   (b) Are there other sources of extension knowledge/idea
6. Comment on variance in compliance among contract tobacco farmers with regard to the target set by BAT?
7. Are there topological factors that have influence on the reforestation program?
8. What are some of the risks farmers face in tree planting?
9. How do farmers respond to the risk factors?

C) SHORTFALL IN WOOD FUEL SUPPLY, CAUSES AND COPING MECHANISMS

10. Do farmers experience shortfall in wood fuel supply?
11. What are some indicators of shortfall in wood fuel supply?
12. What causes shortfall in wood fuel supply?
13. How do farmers cope with the shortfall in wood fuel supply?

D) ENHANCING LEVELS OF RESPONSE TO THE BAT RE-AFFORESTATION PROGRAMME

14. Can you identify relationship (s) between tobacco production and deforestation?
15. How effective is the reforestation programme in achieving its intended goal?
16. Is there a possible alternative to the reforestation programme?
17. Who should design the reforestation programme?
18. What should be done to enhance response to the reforestation programme?