THE ROLE OF SMALL SCALE BRICK PRODUCERS AND THE USE OF BRICKS IN RURAL HOUSING:

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DECLARATION

This Thesis is my original work and has not been presented for a degree in an other University

Signed _____

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This Thesis has been submitted for examination with my approval as University Supervisor

Signed _____

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Dedication

To

My parents, brothers and sisters

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ABSTRACT

The construction sector plays an important role in most developing countries. This is because in the initial stages of their development, countries tend to divert a substantial portion of their national income to the construction activities. This means that the success of any housing development is influenced by the availability of building materials. The production of building materials can be from either the formal or informal sector.

The production of bricks by the small scale producers in the rural areas has become significant. Most of the activities that they undertake are not enumerated in any Government records. This is why they have been termed as the informal sector. The role they play especially in the construction industry in the rural areas has led to the improvement in the quality of housing. It is because of this that the study set out to examine the roles played by the small scale brick producers in rural housing development. The study also examines the various constraints that the small scale producers face in their operations. The study is also to

come up with policy recommendations towards the encouragement of better production of the material now and in future. This study was done in Manga Division of Nyamira District, and it only considered the small scale producers that are in operation. Three types of respondents were selected, the first category were brick producers and the second were brick house owners and finally non brick house owners. The house owners could show the level of utilisation of the building material, and also whether the material can be used in future.

The main finding of this work is that the roles of the small scale has been on the increase. This can be shown by the improvement in the housing quality, the expanding production, development of skills, use of labour intensive technologies and as a source of income. However, despite the roles played by the small scale producers it was found out that they are faced with various problems, such as lack of managerial skills, lack of quality controls, lack of records and lack of finance.

In the light of these findings certain recommendations are put forward. In order to encourage production and expand the roles of small scale producers, there is need to adopt a more comprehensive approach. The

Government should set out policies that are geared towards the support of small scale producers especially in the rural areas. Information on geological deposits should be passed on to the small scale brick producers. They also need institutional support, upgrading of their technologies, quality controls, manpower training and finally control production that which does not affect the environment. If the measures mentioned are taken into consideration, then the producers of building materials are going to be an inspiration for better building material production and improvement in housing quality in the rural areas.

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CHAPTER ONE:

1.1 Introduction:

The Governments of developing countries have paid little attention to the development of the building materials industry. The building materials industry plays a major role in contributing to the success of building programmes. The development and establishment of small-scale and labour-intensive techniques of production should also be encouraged. Technologies that are easily acceptable and require less capital to start may be of the greatest [illegible] building materials. Thus, appropriate [illegible] for producing building materials should be developed. The use of indigenous raw materials should be developed. The use of indigenous raw materials and resources in some developed countries such as Canada has led to the improvement in the quality of housing.

In many developing countries, the large scale corstruction that goes on with industrialisation makes a heavy demand on the building materials industry. This industry is less developed and is not yet able to meet the demands satisfactorily.

It is of necessity, therefore, to state that many development plans may be affected if no adequate attention is given to the development of building materials industry. Some of the small-scale building material production units operate in rural areas and

others in urban areas, often unregistered and with their activities not enumerated in governmental records. They are part of a complex network of activities which have been termed the "informal sector". There are several limitations facing small-scale building materials production units in the informal sector, but their demonstrated ability and potential contributions are more significant.

1.2 The research problem:

This study is mainly to examine the production of building materials by the small scale units in the rural areas. The building material chosen, is the burnt clay bricks which are increasingly used in rural housing programmes.

The study is to examine two aspects; the first one being the major roles played by the small scale brick producers. This is in terms of the improvement in the quality of housing in the rural areas, the use of appropriate technology and the use of locally available resources.

The second aspect is to examine the possible constraints that small scale producers face in their operations. These are problems in terms of production, quality control, transportation, finance and energy supply.

There has been great contributions by the small scale brick producers, especially in the provision of the material for housing construction. Most of the studies done, have little emphasis on the small scale brick producer in rural areas. There has been lack of information on the appropriateness of this material in housing development. Most researches done have been mostly concentrated on the urban housing requirements, hence very little has been done as regarding some building materials especially those produced in the rural areas.

In Kenya both local and imported building materials are used. The greater part of materials in Kenyan building and construction industry are basically local materials and most of them come from the rural areas. The production of burnt clay bricks by small scale producers have been found to be widely adopted in most rural areas. They are being run sometimes as family business units generating some income to the family, creating employment, especially for unskilled members, and also providing building materials for own housing construction.

It has also been found out that the small scale producers are located at widely dispersed points. This means that with their dispersal they can be suitable with the pattern of construction at their localities.

The cost of transportation may be reduced because they are easily accessible and near to most of their customers.

The other area to be investigated is whether they can be used to serve as the foundation for expanded production. The study is necessary because of the support and effective use of locally available skills and labour. This may accelerate the production of more bricks, and may reduce dependence on materials and equipments from distance places.

It is also of importance to examine if the present production can be improved to enable the local communities to become self reliant in locally available building materials. This study was to come up with possible suggestions on the improvement of production of bricks that are being undertaken by the small scale producers.

1.3 Significance of the study:

The development of the building materials is an essential part in housing construction process. The Bouwcentrum International Education, in their study on building materials situation in Kenya stated that about half of all investments in developing and developed countries, is in construction of houses (BIE 1974). This shows how significant the building material production sector is to a region and an

economy.

It is also shown that investment in construction creates a demand for building materials. Since building materials form about 50 percent of inputs in construction by value, then a study on the building materials becomes important.

In a developing country such as Kenya, building materials form a significant proportion of the industrial products. The industry has also become a significant employer of unskilled labour. Small scale producers of building materials play a significant role in supplying building materials to the construction programmes going on in the rural areas of the country. The small scale producers also utilise local labour force and locally available raw materials. Hence it becomes significant for such a study, since it may be an encouragement to the expansion of the sector.

The construction of better residential, commercial and institutional houses leads to the improvement of the built environment. This will consequently lead to the development of the building materials sector, which is an essential part of the development process. The small scale producers have always been overlooked by policy makers and it is at this level that they should be incorporated into housing policy framework.

Expansion of production may be affected if the producers face serious production problems. If problems can be identified early then remedial measures may be undertaken to improve production accordingly. This makes this stuly significant because it examined some of the production problems affecting the small scale producers. Some of the constraints they face have been overlooked in the past and needed to be examined. This is to give policy makers and the producers a direction of the future trend of the brick making industry.

1.4 Definitions:

Small scale production units: This term is used here to mean an operation having few employees between 3 and 5, little capital of less than Kshs 5000 with limited output. It also shows other characteristics such as, production with locally available raw materials, production for local markets and is labour intensive.

Appropriateness: This term is used in reference to the type of building material which should have certain characteristics. The material that is produced locally, cheaply and abundantly available. It's production should be able to use local fuel, easy to transport, climatically and socially acceptable. Finally it should be safe, durable, and the technology

used in it's production should be understood by the local people themselves.

1.5 Objectives of the study:

The study had the following objectives:

General objective:

(1) To examine the role of small scale burnt brick producers in rural housing.

Specific objectives:

(a) The use of bricks in housing and the quality of the these houses.

(b) To find out who are the major consumers of the bricks that are produced by the small scale production units.

General objective:

(2) To assess the problems that the small scale production units face in their production process.

(a) To examine the production problems faced by small scale producers

(b) To assess the infrastructural and technical problems such as, energy and transportation.

(3) To suggest possible recommendations that can be adopted to improve in the production of bricks.

1.6 Research hypothesis:

This study was intended to test the following hypotheses

(1) The use of burnt clay bricks has influenced the construction of better quality houses in rural areas.

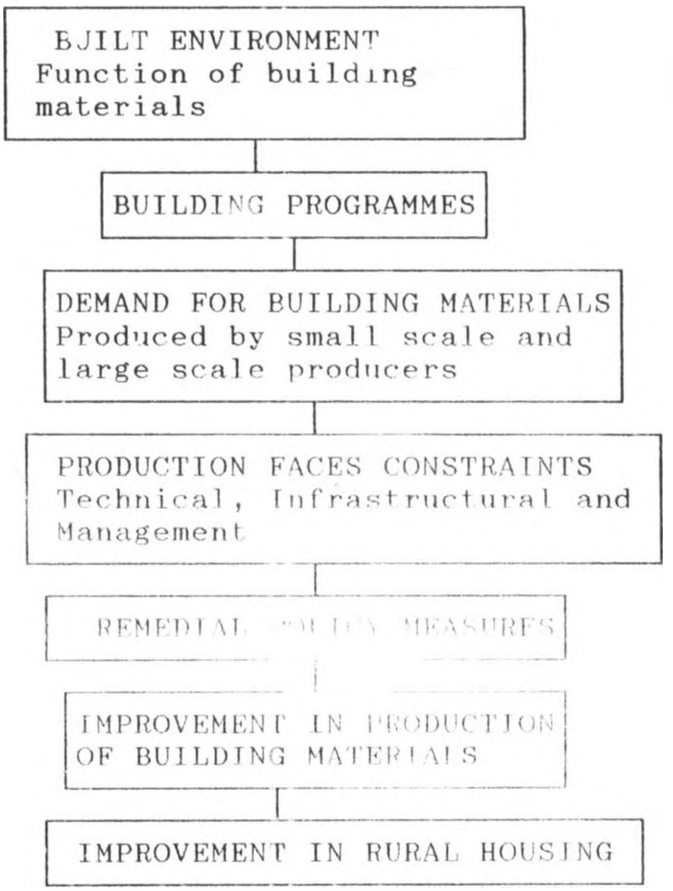
(2) There has been an expansion in the roles played by small scale brick producers in the rural areas.

1.7 Conceptual framework:

The production of building materials is considered as a step in the process from the raw materials to the construction of the built environment. The development potential can also be determined by the demand for building materials which is established from the needs of the local people and that of the country. This can be expressed quantitatively in the building programmes that goes on in that locality or in the country.

Construction programmes can only succeed if the building materials used are easily and cheaply obtained. The production of the materials by the small scale producers especially in the rural areas have played a significant role in housing construction. This is because the small scale producers that are to be examined utilize the locally available resources.

Conceptual model:



Source: Own perception:

The small scale building materials producers have been instrumental in the supply of building materials for rural housing. The expansion of this sector has led to the improvement of the quality of housing in the rural areas. The greater the expansion the more the roles they will continue to play.

The above model shows that the built environment is a function of availability of building materials. This will lead to the expansion for building programmes in both rural and urban areas. As the building programmes expand there is an increase in

demand for building materials produced by small scale and large scale producers.

Production of building materials, however, faces some constraints such as technical, infrastructural and management. Remedial policy measures need to be undertaken to assist the producers of building materials. This will lead to improvement in the production of building materials in the rural areas where small scale producers are mostly located. The production of improved building materials that utilise local resources may lead to improvement in rural housing programmes.

Developing countries have limited resources to [illegible] into building materials. Thus, the emergence of small scale producers utilising traditional methods of production are appropriate in building material production. The level of exploitation of the available materials in any region depends on the physical characteristics of that region. This include, the type of geology and soils for use in production. Technical and infrastructural problems will also affect production significantly.

Remedial policy measures should be undertaken early enough so as to encourage small scale building material producers. The study will come up with such measures where possible.

1.8 Scope of the study:

The area that was chosen for the study is Manga Division in Nyamira District. The other divisions include Borabu and Nyamira. The division has a high number of small scale production units than the other two divisions. Most of these producers are spread in many parts of the division. The production units are found on specific topographical and geological areas within the river line plains which have clay type of soils. These areas are found dispersed within the division. In each river line plain there is at some brick making taking place.

The study also surveyed brick house owners, and non brick house owners in the division. The division was chosen because it has many producers spread in the division unlike the other divisions which have a small number of producers. The division was also chosen because it was convenient to the researcher who comes from the study area.

1.9 Research methodology:

In order to collect data from the small-scale producers in the division, production sites (river line plains) where production of bricks take place were sampled randomly for the study. There are in total about 100 producers in operation in the division. The small-scale producers selected were

those who were producing for both sale, and for own use.

In some of the river line plains there can be found about 5 to 10 small scale brick producers in about a square kilometre. Most production is done on commercial basis. In total 7 river line plains were chosen for the study and in each 5 producers were chosen, a total of 35 brick producers were selected, representing 35 percent of the producers which was considered to be fairly representative of the producers.

The study also collected data from the brick house owners in the division. The number of brick houses in the division is approximately 400 and a total of 40 brick house owners were selected representing about 10 percent of the brick house owners, this was considered to be representative.

The other group of respondents chosen were the non-brick house owners who happen to be the majority in the division and total to approximately 23,000 . A sample of 46 non-brick house owners were selected for the study this is approximately 0.2 percent of the non-brick house owners. In total the respondents selected were 121 the house owners were 86 respondents.

1.10 Analysis:

Various techniques were employed in analyzing the data collected both primary and secondary. The frequency tables have been used to show certain characteristics. Descriptive statistical analysis and use of inferential statistics have been applied to find the mean of bricks produced, incomes from bricks and cost of construction.

The chi-square and Crammers V are used in testing relations between house owners and various social and economic characteristics. These include certain variables such as levels of income, cost of house and level of education. Various tables are also used to make comparisons between house owners and the quality of the houses.

CHAPTER TWO

2.0 LITERATURE REVIEW AND POLICY BACKGROUND:

This chapter will examine some of the related literature on the small scale building material production. Some of the work done is general to the small scale producers and the others are specific to brick producers. This chapter also looks at the policy framework of the Kenyan Government on housing nationally and specifically on rural housing policy.

2.1 Literature review:

2.1.1 Production of indigenous building materials:

In a background report on the Small Scale Production of Building Materials convened by Habitat (1985), some observations on the building programmes were made. In most construction programmes, building materials constitute the single largest input for the production of shelter, infrastructure and related amenities. When building materials are readily available and cheap the construction process, and, by implication, the development process is facilitated.

In many developing countries, however, building materials have become the main bottleneck to construction activities. This is due to three related factors. First there is a high degree of import

dependence, relying on limited foreign exchange resources. Secondly inappropriate production technologies have been adopted so that cost and quality of materials have not met most needs. Thirdly, opportunities have been neglected of developing cheap and appropriate local building materials in quantities sufficient to make importation of substitutes unnecessary.

In a research carried out in Canada by Habitat (1985) about small scale production of building materials, various results [illegible]. It was found out that when Canada was [illegible] industrialised and development was less integrated, housing construction relied upon small scale building material producers.

Canada's Indian and Inuity communities tend to be remote and self reliant. They provide a good example where small scale building materials production application and appropriate technologies are being used.

They were found in most rural areas where they were diverse and dispersed. Because it was such a diverse process with considerable variation across the country, each local community depended on it's own skills, supply of resources and building materials. In this sense, Canada's experience and evolution has some common roots with countries which, for a variety of reasons, are still at that stage of development.

The study further revealed that there were advantages of using local building material and available technology. It is clear that the development of local materials (from local resources) and the application of local technology can be a very important economic stimulant. This may be an obvious source of employment, economic growth, expanded production and relevant shelter production. Indigenous architecture is often adopted because it is environmentally, aesthetically, culturally, and socially acceptable with great success. This is an important part of growth and development which tends to be neglected by the importation of international or "western" building materials and technique.

Many countries in developing countries are spending disproportionate amount of their currency on importing building materials and technology. This deprives their economies of other urgently needed necessities. A severe bottleneck in meeting the shelter needs of poor people in Africa, Latin America and Asia result from the fact that many countries fail to use local materials, or fail to relay on local technology.

The UNCHS (1984) theme "The Small Scale Production of Building materials" states that it is important technically, economically, socially and culturally to use small scale building material

producers. This type of production forms part of a development strategy which emphasizes increased self reliance, efficiency and above all builds on experiences which are relevant to solving local housing needs. Man's principal aim in this regard is to enclose space for a variety of human and social needs. Hence to do this effectively and efficiently the use of resources that are readily available and appropriate is significant. This concept is particularly vital in meeting the increasing shelter needs of rural people.

The United Nations Commission on Human Settlements has considered recommendations to improve on settlements. This is meant to solve a variety of problems, and distinguish those recommendations applying to developed countries. This is to be done by reflecting on different conditions and social-economic needs of each society. The categorisation of settlement issues in recommendations concerning the theme "Small Scale Production of Building Materials" may not appear appropriate. Many countries, especially those fully industrialised have regions within their countries that have reached a high level of development and others that are still relatively underdeveloped depending on resource endowment potentials.

On his study about the Chinese building material, Zhuo (1983), found out that there is a common use of local building materials. In China where the study was carried, the tradition of utilizing local materials has been experienced for thousands of years. The Chinese people have been taking advantage of a variety of local materials, such as earth, stone, and wood to build various kinds of buildings and structures.

According to historical records, during the Han Dynasty in China about two thousand years ago, people were able to make all kinds of bricks. Some of the bricks were made with a high artistic decorative patterns. Presently the Chinese people have accumulated a wealth of experiences and acquired the mastery of techniques in using, bricks, tiles and stone. The classical Chinese architecture is renown for it's unique style in the world history of architecture. Today in China, large number of traditional houses in the vast rural areas are built on local materials especially with bricks and stone. This kind of experience can be borrowed by other developing countries that are in need of developing their indigenous materials production.

Kateregga (1983) asserted that the small scale production units utilization of earth in housing is one of the oldest common methods used by developing countries by a large proportion of the population.

This is because earth has several advantages to offer as a building material especially for the poor and for the rural population. It is normally cheap, locally available and cheap to maintain. However, despite all these good qualities, earth as a building material, has remained unpopular. In many countries it is officially unacceptable as a building material. This is because it has many other weaknesses or poor qualities, when used as a building material.

Rai (1983) of Central Building Research Institute Roorke in India, did a study on [illegible] is a low cost building material. The study established that the material is highly adapted in India. Brick making in India continues to be a rural art and could be considered a rural product for housing. One of the problems the producers face in India is usually the high fuel consumption in the burning process. It is also true that brick making and brick use in Kenya is mos'ly found in the rural areas.

Nzainga (1979) asserts that in overcoming the constraints of construction it requires commitment on the part of the people vested with the responsibility of formulating ways in control in order to facilitate the provision of adequate low cost housing. The sad but inescapable fact is that whatever the standards might dictate, people are going to build, and build what they can, but with what material? Building

materials used should consider the socio-economic characteristics of the people.

2.1.2 Constraints to small scale production:

Several researches have been done on the state of building materials in the third world. Habitat (1984) in a similar research found out that the insufficient production of building materials is one of the most serious problems affecting not only the building industry but also the national economy of developing countries. The poorly developed building materials production reflect underdeveloped economic conditions, lack of investment capital, limited markets, scarce fuel, poor transportation and inadequate skilled manpower. These are some of the serious obstacles blocking development, while at the same time unexploited raw materials are often available locally in abundance.

In one of it's findings on building materials production Habitat (1987) states that planning for building material production requires specific actions. This should include an evaluation of the current and prospective demand for the supply of building materials. In that connection, geological surveys of basic raw materials for housing construction should be undertaken as well as an inventory of organic materials available in a region.

Some evaluation of qualified manpower and entrepreneurial business capacity should also be made. The availability of fuel and transport should be assessed to ease production. It is also recognized that one of the main constraints affecting demand and supply of building materials is the fluctuation of the construction industry especially during periods of economic recession . Few countries have generated workable policies to co-ordinate the development of the building materials industry with the planned demand for construction. [illegible] also a common obstacle in the development of [illegible] scale production of materials in the rural areas of Kenya.

2.1.3 Quality and standards control:

On a study carried out on soil blocks in Kenya by Syagga (1989), certain observations were made. It was found out that there is a worsening situation of the building materials sector in Africa as a result of high dependence on imported inputs for production. The few building materials which are popular in the market are prohibitive in cost or not available in sufficient quantities. In contrast there are traditional building materials which can be produced in sufficient quantities and at affordable costs to satisfy the housing demands. Most of these materials have not yet had the desired impact on the

construction market.

It is often observed that one single most constraint to the development of indigenous building materials is the lack of standards. There is need in maintaining quality of production for any building material even if it is locally produced. In the building regulations and codes of practice there is little or no reference to low cost building materials especially the indigenous materials. It becomes necessary to consider including such materials in official documentation.

He continues to state that, the promotion of standards and quality control measures in the traditional sector can be an effective way of improving production. There is need to ensure quality production and cost reductions in this sector, hence of increasing demand for indigenous building materials. In Kenya some effort has already been made in the use of soil blocks as an appropriate building material as a way of improving indigenous materials production.

Housing Research Development Unit (HRDU) at the University of Nairobi and Action Aid Kenya and other agencies have been involved in extensive use of low cost building materials. They have set up a number of demonstration projects in several parts of Kenya. Different methods have been used to create awareness

and promote effective community involvement in the production of building materials. The small scale production bricks is done with very minimal level of considering specification of standards. But somehow the materials produced are highly in demand in the market. This is a common practise in the rural areas where small scale producers are found.

Davey (1961) found out that it is not known precisely where and when small scale production of burnt clay bricks were first used. The earliest known bricks are those found in archaeological excavations in the cities of Mohenjo-Daro and Harappa in the Indus valley, in present day Pakistan, which flourished between 2500 and 1500 BC. At the same time, bricks were used in Sumerian cities on the Tigris and Euphrates Rivers in present day Iraq. In India, bricks continued to be used, often in conjunction with stone. It will be observed that from earliest times burnt bricks were mainly used for building of public or religious buildings.

Spence and Cook (1983) in their study on building materials in developing countries found out that it is only in recent times that small scale production of bricks has began. Bricks have started to replace other less durable materials for ordinary house building. Indeed in some parts of India and Africa the proportion of brick build homes in a village can be

used as some sort of measure of it's level of prosperity. However, there are other parts of the world where, although all the necessary raw materials are available brick burning has never been introduced. The study is to examine the use of bricks in the rural areas of Kenya. The use of local materials should be encouraged so as to encourage the growth of small scale producers.

The use of such materials in other parts of the world has proved successful. Countries such as China and India have used brick [illegible] in rural housing. Small scale producers have started production in the rural areas of Kenya need to be motivated.

2.2 National housing policies:

This section will try to look into the policy issue on housing in Kenya. It will also examine some of the shortcomings that do exist with the present policy framework that will need to be looked into in the future especially on rural housing and building materials production.

Elaborate National Planning began after independence for all the government sectors. Various policies were made and these have mainly been reflected in almost all the post independence development plans and in various official documents and publications. However, at the time of independence

there was an already existing shortage of housing.

In response to this the government invited the United Nations experts to make recommendations on housing policies within the framework of social and economic planning of 1965. Among other issues, they recommended the establishment of a National Housing Authority with more powers than the already existing Central Housing Board. They also recommended coordination and initiation of development by the local authorities.

Following the publication of the United Nations report on housing needs a sessional paper number 5 of 1965 was published. It highlighted the major housing policies. The Ministry of Housing was established. Also following this recommendation the National Housing Corporation was established in 1967. This shows the Government's commitment towards improvement of the housing sector right from the time of attaining independence.

2.2.1 1964-70 Development plan:

This was the first development plan. This development plan had no priorities as far as housing was concerned. However, the plan reaffirmed the government housing policy by focusing attention on such issues as the problem of rural to urban migration and inability of the majority of the urban population

to secure housing of reasonable quality. Although the government was a ware of the financial limitations of the low income groups, it discouraged any type of subsidy on housing.

The 1964-70 development period witnessed a shortfall of 7500 units per year. This shortfall was met by individual families who had squatted on public and private land built whatever poor shelter was within their means. These were usually fashioned of mud, wattle and tin. This shortage was an indication of how critical the housing problem was becoming since the population at the same time increasing. In this plan it is the Government's rural development policy to stimulate increased economic activity in the country as part of the plan to make rural life more stable and attractive for the people and to reduce the drift of population into the main towns. A dynamic approach towards the diversion of industry into such new centres was to be encouraged.

It was the government's policy to use building demonstration teams in selected centres, together with public health workers and community development staff to teach rural people to build good houses and to draw on years of traditional African experience. The emphasis was to be on self-help and the use of local materials. Display centres were to be organized in the Districts so that rural communities may be shown

improved type plans, models and high standards of housing that can be achieved by using local materials. Every encouragement was to be given to the people to form the themselves into co-operatives and self help groups and technical assistance was to be provided for such groups. Where necessary, loans in the form of roofing materials were to be given for demonstration.

According to this plan it was stated that housing conditions are among the most essential aspects of the standard of living. In order to meet the housing needs and to stimulate the growth of the economy an expanded programme for house building was given high priority. In 1966/67 the central government financial contribution through the Ministry of Housing was raised to K£ 1.7 million up from K£ 453,000 in 1966/65.

In order to meet the urgent housing needs considerable improvements were to be made. The improvements in the quality of the traditional rural housing, demonstration in the use of building techniques and materials, and the provision of brick making and other equipment for local production of more durable will be extended to the rural areas. Emphasis was to continue to be placed on self help and co-operative effort of the people in solving the rural housing problem.

This plan had good programmes for rural housing development . It is however clear that immediately after independence the Government did not allocate enough resources to support housing programmes in the rural areas. From this plan the use of indigencus material is taken into consideration. These materials which include bricks are thought to be a good step forward towards improvement in housing in the rural areas.

2.2.2 1970-74 Development Plan:

According to this plan the prime objective of the government policy was a move towards a situation where every family in Kenya will live in a decent home whether privately or state sponsored which provides at least the basic standard of health, privacy and security. However, due to the inadequate incomes for many families, decent housing along with the other elements of minimally adequate standard of living were going to be beyond the reach of many.

The main objective was to increase the housing stock. The formation of Housing and Research Development Unit (HRDU) was to embark on research development programmes that are geared towards housing quality improvement.

From this second National Development Plan, a new rural housing policy is defined. This meant that those who can afford to take up loans to build or improve their own housing in the rural areas would get the loans from the National Housing Corporation. The availability of building materials is noted as an important component for housing sector. The objective of promoting building materials is by encouraging domestic production of such materials. The Government was to continue to support the use of such through research and experimentation [illegible] also going to promote the use of domestic materials whenever this leads to greater efficiency and lower costs.

This plan had emphasized on research on the type of building materials that can be used in housing. The plan does not identify on how to meet some of these objectives which require some financial support. The plan did not specify how much resources were set a side on building materials and on the rural housing development.

2.2.3 1974-78 Development Plan:

The policy was to continue in more or less the same way as laid down in the previous plan. However high priority was placed on the rapid housing demands. The desire was to streamline housing design and construction with government standards.

The Government allocation of funds to housing was to total Kshs 689.2 million compared with Kshs 297.8 in the previous five years, an increase of 230 percent. It was envisaged that four times as many housing units were to be built in the plan period compared with the previous five years.

In 1972, housing construction comprised more than half of the building construction industry's total investment outlay. The shortage of low income housing and the continued existence of substandard housing are especially urgent problems. [illegible] construction will accelerate, with increasing emphasis on construction of and research into low cost housing. Rural housing situation was less emphasized in the plan.

2.2.4 1979-83 Development Plan:

The Government's objectives for the building and construction sector during the plan period was as follows;

(i) to improve the planning and execution of the Government buildings and works programme.

(ii) to locate new buildings projects in the service centres scheduled for expansion by the government and local authorities; these projects will create facilities for people living in the surrounding rural areas and also influence development in, the private sector.

(iii) to create employment in the rural areas where building projects will be located;

(iv) to promote further the standardization of building practices and to sponsor measures aimed at the minimization of building costs.

The prime consideration in the objectives outlined above is the improvement of facilities and income generation, particularly, within the rural areas. The public interest was to be best served if the buildings and construction industry was carried out at minimum cost.

To promote the achievement of these objectives a Research and Development Unit was established in the buildings department of the Ministry of Works. The Unit was to be strengthened during the plan period and it's work programme was to focus on various aspects of housing developments. Among these were;

(a) to select appropriate quality standards for each new projects and encouragement and

(b) improvement of traditional building components.

This plan takes into consideration on the improvement of housing in the rural areas where the majority of Kenyan people live as of prime importance. It also accepts the fact that local building materials and traditional techniques of housing construction should be used. The Government increased it's share of development funds for rural housing from K £1.5

million to K £6.8 million in the plan period. The plan had the following aspects on housing development:

-it was to continue to provide loans to individuals in the rural areas for housing,

-provide building type plans,

-provide technical and financial assistance to approved rural housing societies,

-carry out research on the use of local building materials,

-carry out pilot rural housing projects.

This plan is most elaborate on housing programmes especially in the rural areas unlike the other previous plans. The type of houses and materials to be used are taken into consideration in the plan.

2.2.5 1984-88 Development Plan:

In this plan there is an indication that the housing sector has been facing a number of constraints in the recent past which are to be addressed during the plan period. These include shortage of technical manpower, limited availability of locally manufactured materials and various impediments to timely completion of projects. These constraints will be ameliorated by improved organization of the implementing Ministry. The standardization of building materials will also be considered in this plan.

During the plan period, it is stated that the previous plans have been lacking data on the state of rural housing. During the plan period, a housing survey will be conducted to provide baseline data for use in the design of a suitable strategy for intervening in this area.

The primary responsibility for rural shelter improvement will, however, continue to lie with the rural household themselves. Subject to availability of funds Government will continue to provide rural home improvement loans and also [illegible] the promotion of appropriate environmental [illegible] measures within the rural areas.

This plan has set out various detailed objectives towards housing development. It has several programmes on housing strategies especially urban low cost housing, private sector housing development and co operative housing.

In this policy it is stated that rural housing will continue to be done by the local people themselves. Subject to availability of funds the government will assist where possible. The plan also take into consideration that there is lack of adequate data on rural housing situation which should be carried out in the next plan. There is very little on the production of building materials in the rural areas unlike in other plans.

2.2.6 1989-93 Development Plan:

The plan states that, the Government will continue to encourage the provision of decent housing for every family. In the current plan the Government has adopted a number of strategies and programmes aimed at alleviating the acute shortage of housing in the urban areas and also improving it's quality country wide. These include settlement upgrading, rental accommodation, tenant purchase schemes and individual housing development.

There is a serious shortage of housing in urban areas. In order to alleviate this problem, the Government is working towards the elimination of constraints to housing development. Some of the constraints are, the availability of land, cost of building materials and construction finance, inadequate financing mechanisms, inappropriat building by laws and standards and finally rapid increase in population.

The momentum for housing development programmes will continue with appropriate modifications. The real challenge that faces the nation is to find mechanisms for the mobilisation of financial resources for the housing development programmes. During the plan period, the Government will continue to seek solutions to problems that have been inhibiting housing development.

During the plan period the Government will take steps to ensure that more housing development funds are mobilised. This will be accomplished by, first through restrictive government borrowing so that funds will be available for financial institutions that are involved in housing construction. The other method is to encourage institutional housing development by NSSF and Post Office Savings Bank and also encourage co-operative societies in housing programmes.

According to the latest document on housing on National Housing Strategy for Kenya of 1987 to the year 2000. The Government will confine itself to the optimal utilisation of resources allocated to the housing sector. At the same time special emphasis will be placed on greater mobilization of local resources for housing development, such as use of appropriate technology and appropriate locally available building materials.

The emphasis on the latest plan has been on urban housing deficit. The plan is geared towards urban shelter improvements. The housing development programmes through National Housing Corporation (NHC), Housing Finance Company of Kenya (HFCK) and National Social Security Fund (NSSF), are only meant to serve the urban housing needs. The rural housing conditions are not catered for in the plan.

2.3 Rural housing situation:

The main problem is one of improving the existing housing stock and constructing new houses to accommodate new households. The rural housing problems in many ways leads itself to solutions founded on private initiative, although the quality is not adequate in most cases. At the moment several endevours are made to improve the quality of rural housing through various programmes.

(i) Rural housing improvement programme:

The objective of this programme is to uplift the quality of rural housing through utilization of improved local building materials and construction technology. Transfer of this appropriate technology is being effected through Youth Polythechnics to local communities. This programme has an annual budget of K£ 200,000.

(ii) Rural Housing Loans:

The government provides funds to the National Housing Corporation for rural individual borrowing for improvement of rural housing. This form of funding has been so popular that money voted for has fallen short of demands. 1991/92 allocation is K£ 200,000.

(iii) Housing Co-operatives and Women Mabati Groups:

Families mobilise their resources to improve their houses. The figures are not accurate as some of the borrowing is informal, while commercial loans are

not favourable for this enterprise.

2.3.1 Future Housing Requirements:

In 1988, housing needs in urban and rural areas stood at 60,700 and 25,4000 units respectively. The projection for the year 2000 raises the requirements in urban areas to 112,000 units and 300,400 in rural areas. These projections pose serious implications on resources such as land, finance and availability of appropriate building materials.

The Government supports the use of domestic construction materials wherever this leads to greater efficiency and lower costs. Research is being [illegible] the use of local building materials and construction techniques. However, more needs to be done to encourage the use of materials that are produced locally. This encouragement should now be extended to small scale producers of bricks as a material produced locally.

The use of local resources to produce building materials should be encouraged and in this case the small scale brick producers can be very appropriate. The small scale producers should also be incorporated in National Housing Policy matters so as to improve the rural housing conditions instead of focusing only in the urban areas.

CHAPTER THREE

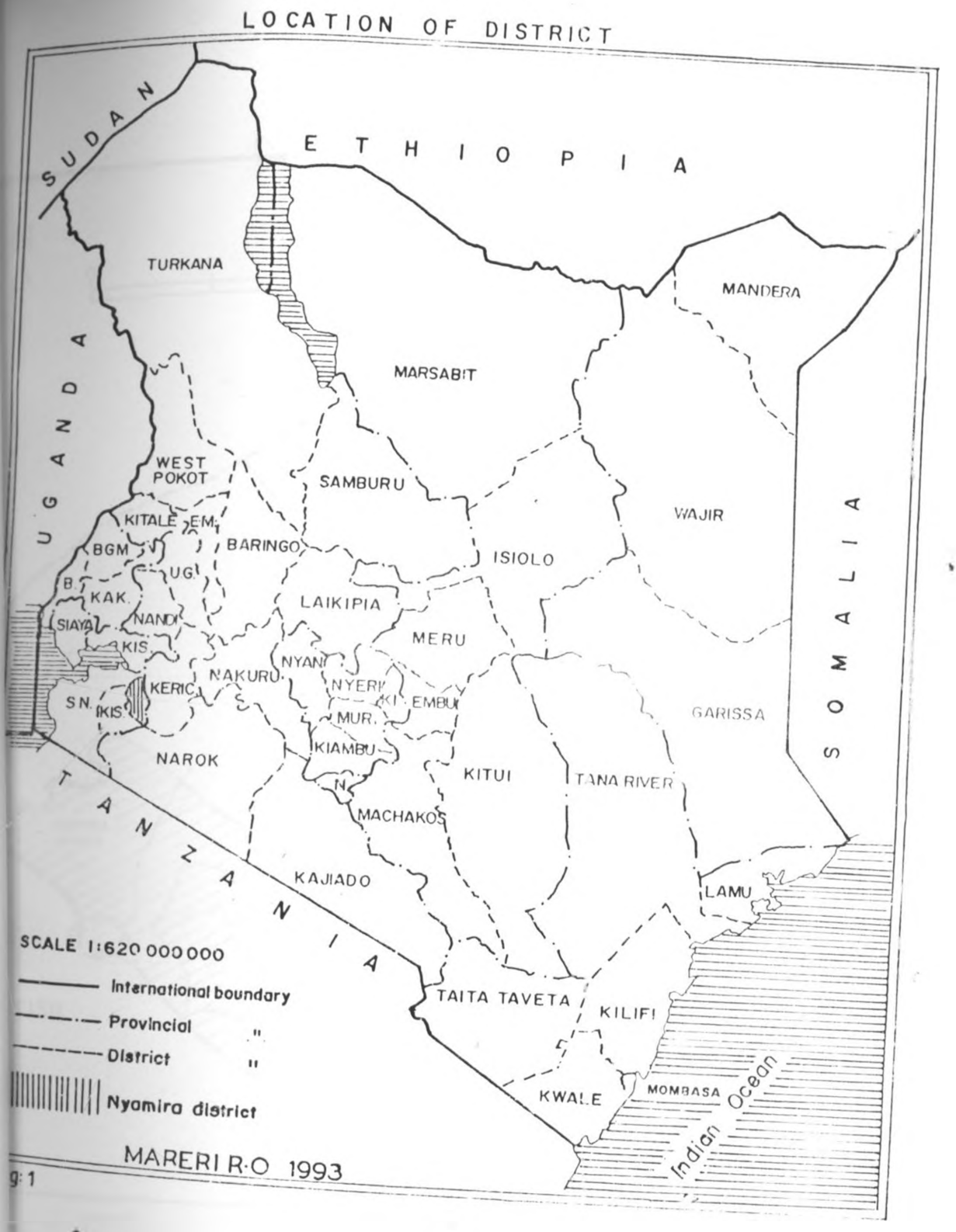
3.0 BACKGROUND TO THE STUDY AREA AND PRODUCTION PROCESSES:

This chapter gives a background of the study area. It starts with the physical background of the District where the research was done. The chapter also looks into the socio-economic characteristics of the whole district in general. The second part of the chapter examines the production processes of bricks beginning from the preparation of the soil to the sale of the bricks.

3.1 Background to the study area:

3.1.1 Introduction:

Manga Division is found in Nyamira District, the District covers an area of 841km sq. making it one of the smallest districts in the Province. It shares common administrative boundaries with Kisii District to the west, Kericho District to the east and South Nyanza to the north. The District is settled by one tribe the Abagusii who are basically agriculturalists. The district is divided into three administrative divisions namely, Manga, Nyamira and Borabu.


LOCATION OF DISTRICT
SUDAN
ETHIOPIA
UGANDA
TANZANIA
SOMALIA
TURKANA
MANDERA
MARSABIT
WEST POKOT
SAMBURU
WAJIR
KITALE
EM.
BGM
BARINGO
ISIOLO
B
UG
KAK.
LAIKIPIA
SIAYA
NANDI
MERU
KIS.
NYAN.
NAKURU
NYERI
KERIC.
KI
EMBU
SN.
IKIS.
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GARISSA
KIAMBU
NAROK
KITUI
TANA RIVER
N.
MACHAKOS
KAJIADO
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SCALE 1:620 000 000
International boundary
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Nyamira district
TAITA TAVETA
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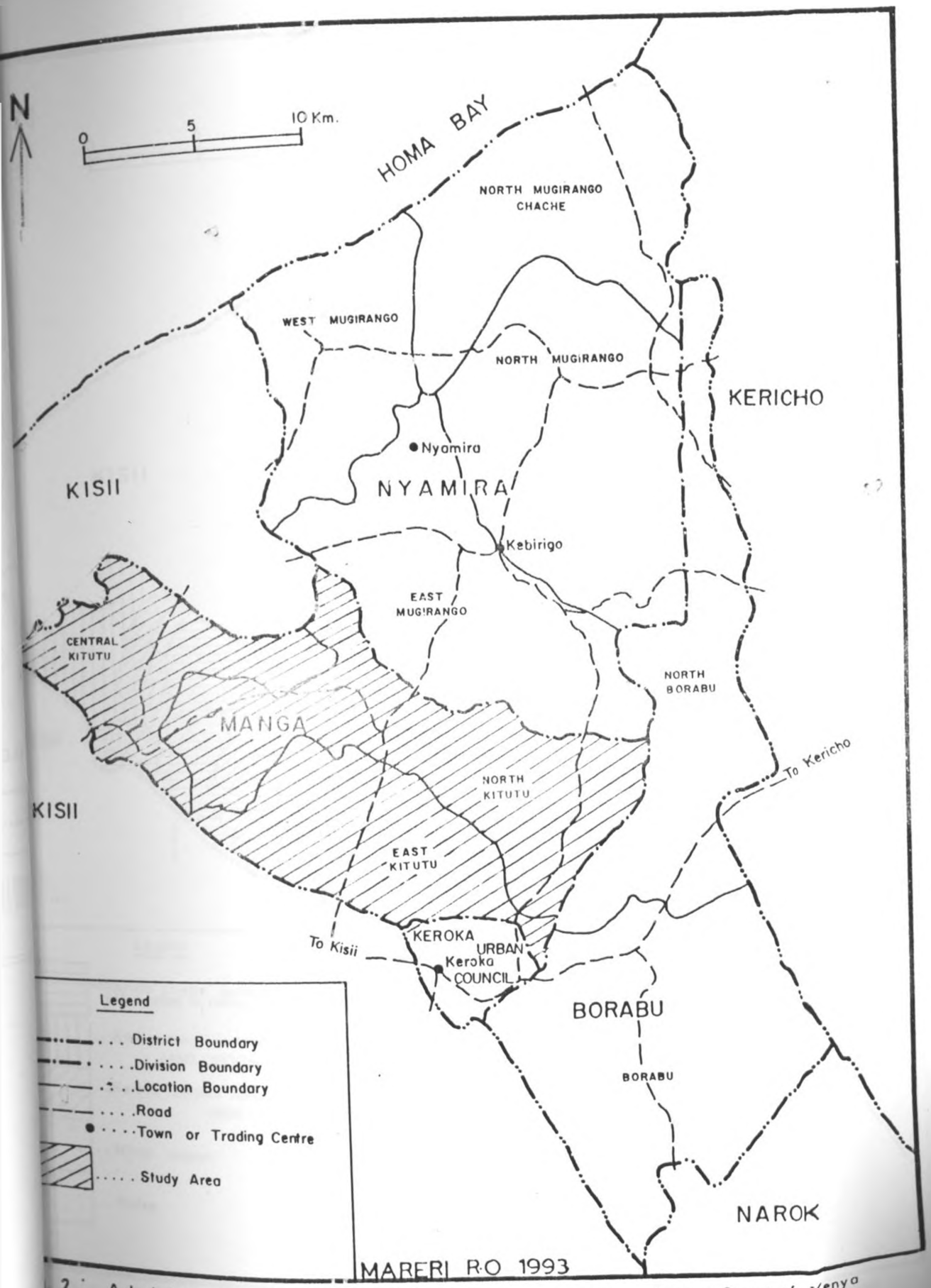
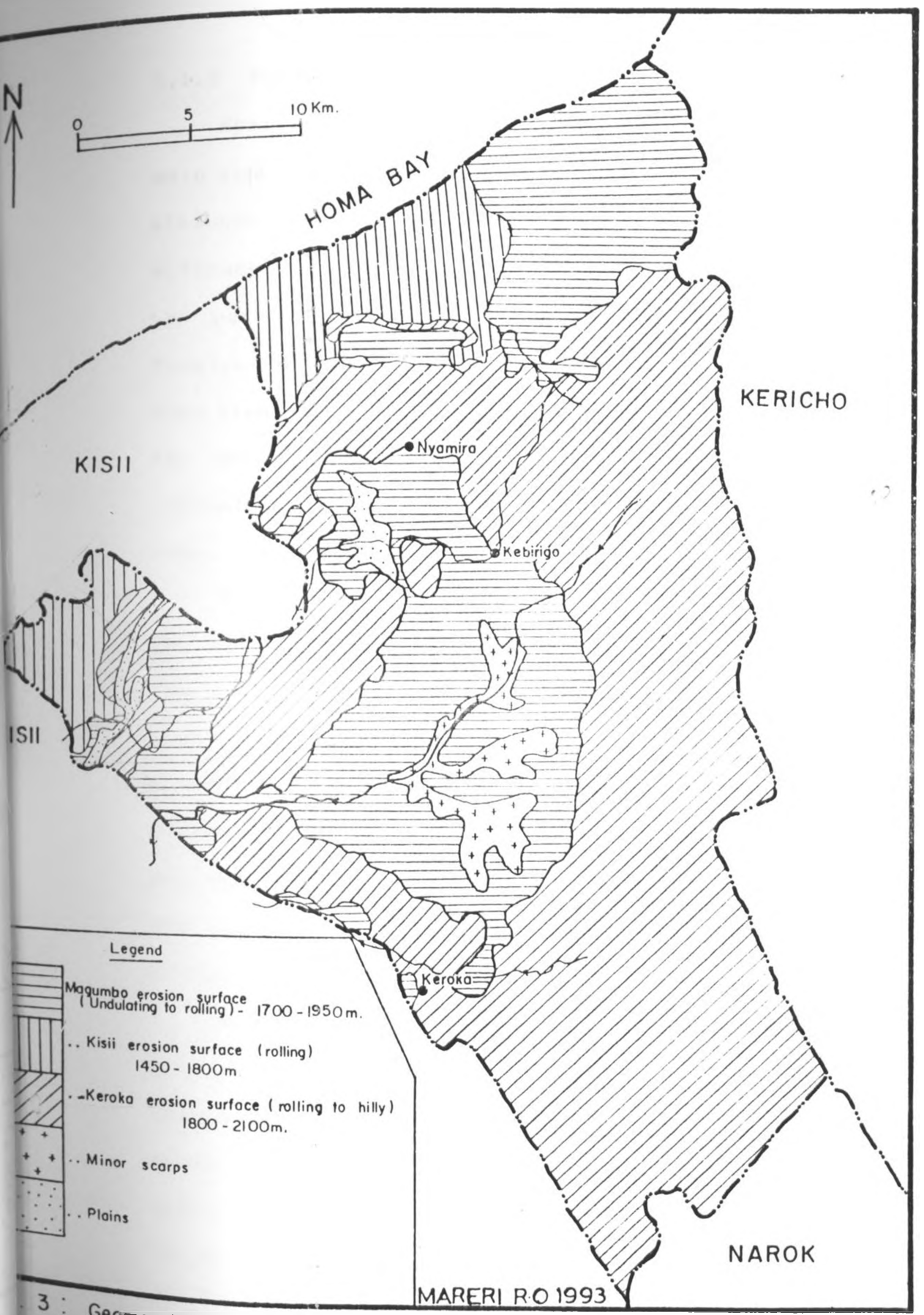


2 : Administrative Boundaries of Nyamira District. Source: Survey of Kenya



3 : Geomorphology of Nyamira District.

Source Dept of Physical Planning

3.1.2 Topography:

Nyamira District can be broadly divided into two main topographical zones corresponding closely to the altitude. The first zone covers all areas whose altitude lies between 1500m and 1800m. In this zone are part of Kuja basin and the Northern parts of Nyamira Division. About half of the total district area lies above an altitude above 1800m and comprises the second zone. The southern parts of Nyamira, central and eastern kitutu are all covered under this zone.

Areas with an altitude above 1800m are generally the most suited for growing tea and pyrethrum. The lower [illegible] are more suited to coffee, bananas and sugar cane. Nyamira District is mostly hilly with several ridges. The more prominent features include Kiabonyoru hills and Manga escarpment. There are several permanent rivers and streams which drain in the district but the main one is river Gucha which drains into Lake Victoria through the district.

There are many valley bottoms and depressions, most of which are marshy. There are hardly any floods because of the hilly nature of the district. The marshy areas reduce the total land area available for cultivation. But the inception of the Valley Bottom Project is helping to reclaim the many swamps in the district.

Because of the rapid population growth, cultivation of steep slopes is now becoming inevitable. As a result, soil erosion is becoming an increasing problem. The hilly terrain also makes communication by road difficult because during the rains, which are spread evenly throughout the year, the roads become impassable. Heavy investment is needed to facilitate the use of the roads throughout the year. The non-use of these roads during the rainy season makes the transportation of major cash crops and other goods very difficult.

3.1.3 Climate:

The district's climate is of highland equatorial zone. There are hardly any pronounced climatic variations. The period from March to June constitute the long rainy season while October to December constitute the short rainy season with an average annual rain fall of 2000mm. January and August record less than 1000mm while April has the highest precipitation of over 3000mm.

Due to it's high altitude, the district does not experience excessive temperatures despite it's proximity to the equator. The minimum night temperatures average about 10.1 degrees centigrade (range 8.1 to 11.1 degrees centigrade) and the maximum day temperatures average 28.7 degrees centigrade

throughout the year. The average normal day temperature is about 19.4 degrees centigrade. These temperatures are experienced throughout the district with little, if any, variation.

3.1.4 Population:

The present population of the district is projected to grow at the rate of 3.25% per annum, making the total population now to be approximately 508,618. In terms of population distribution among the three divisions namely; Nyamira, Manga and Borabu, Nyamira has the largest projected population of 293,857, followed by Manga with 157,171 and then Borabu with 56,620 this is projected by the year 1994. Nyamira division is the largest in size having 102 sq km, followed by Borabu 238 sq km and then Manga 204 sq km, Borabu division has a low population because it is a settlement scheme settled recently soon after independence, it has the lowest density of 238, Nyamira 743 and Manga 747 persons per sq km. The area of the study Manga division has the highest density, meaning that various economic activities have been sought to meet the needs of the people in the division.

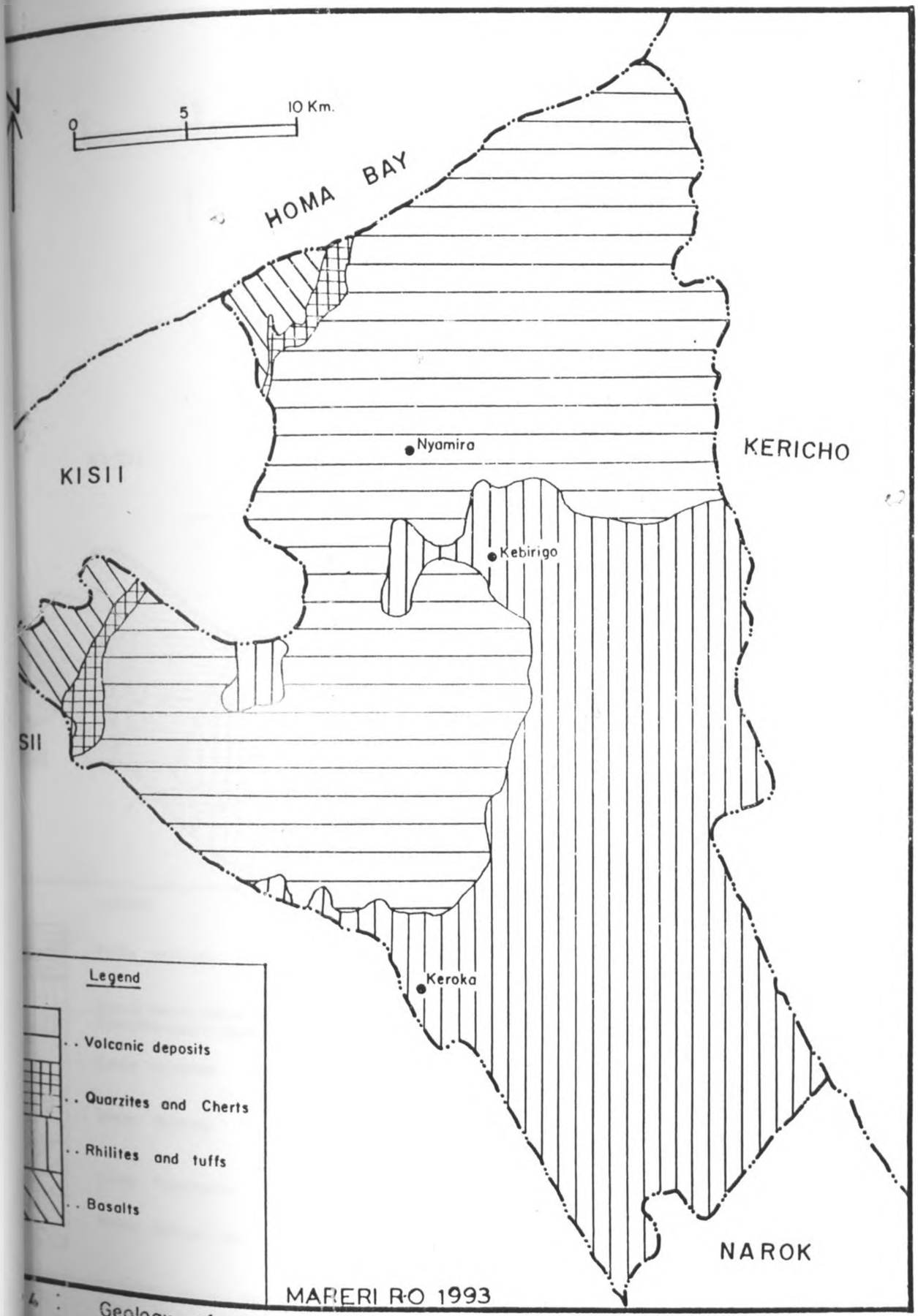
3.1.5 Incomes:

A basic human need is an opportunity to earn adequate income. The main source of income in Mar divfsion is from agriculture. The farming sector, part from being the leading in job creation,it is al the leading in income generation. The division basically dominated by smallholder agricultur farming. Incomes from farm enterprises are high seasonal, above average during harvesting period a low during other periods. According to the Rura Household Survey of 1981-82, the whole district Nyamira had an average net monthly income of Kshs 96 This is slightly above the national average which w est Kshs 829. In small-scale enterprises an informal sector incomes are increasing given th increasing emphasis on these two sectors. This is wh most of the people have opted to look for othe alternative forms of incomes and in this case the small-scale building materials is one of them being undertaken in the division.

3.1.6 Transport:

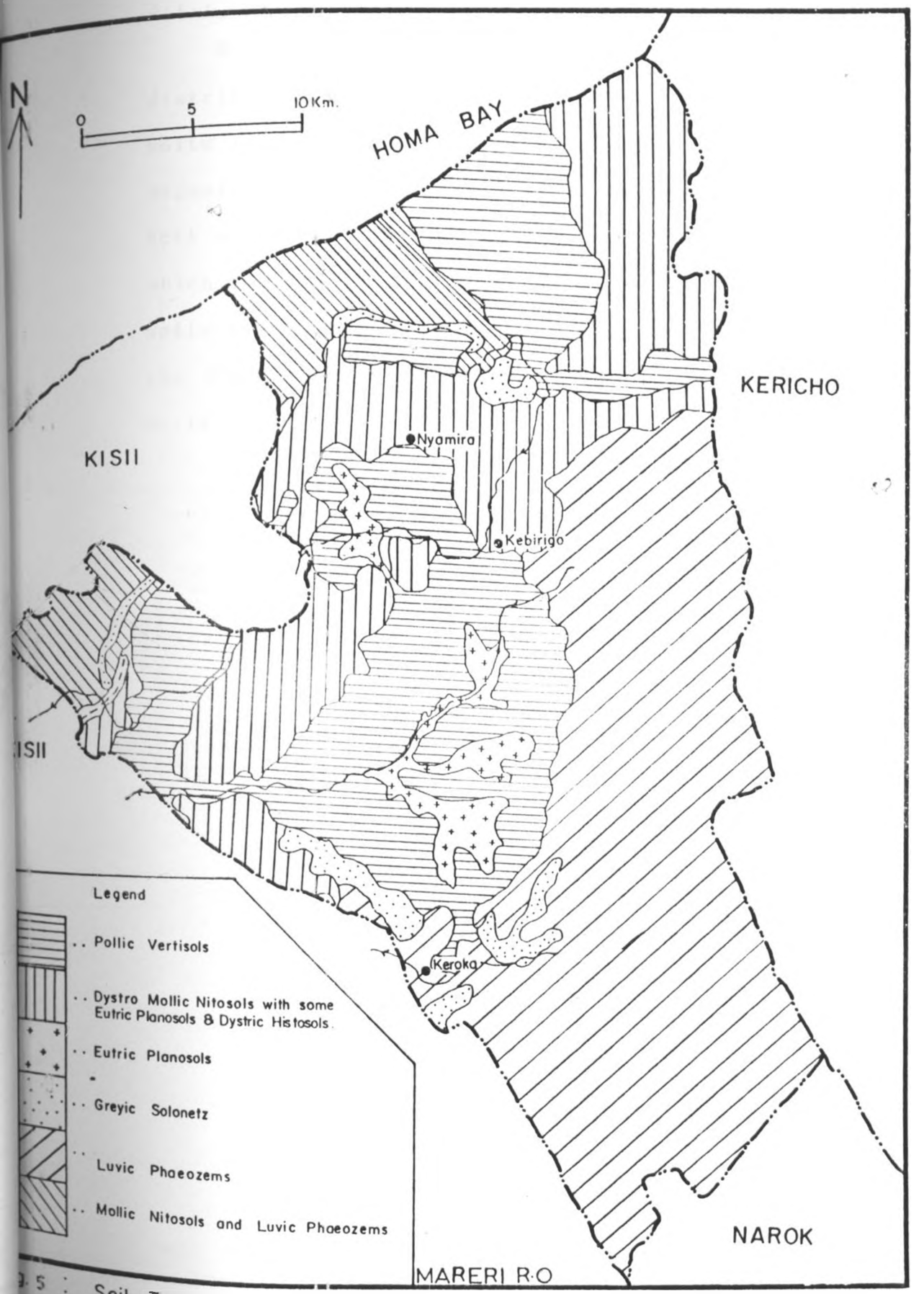
Manga division has a good network of roads, but the main problem is the conditions of the roads. During the rain season most of them are impassable. The main roads through the division include; Kisii - Nyamira, Kisii - Manga, Kisii - Magombo, all are

murram roads. The rural Access Road Programme has benefitted the division, because of late about 40 km of roads have been completed thus opening up most of the remote areas. Transport in the division is important in the transportation of the finished products and in this case the brick transportation is very important factor.



4 : Geology of Nyamira District.

Source: Dept. of Physical Planning



5 : Soil Types in Nyamira District.

Source: Ministry of Agriculture

3.1.7 Soils and land use patterns:

The table below shows the soil types in Nyamira district. About 70% of all the land is red volcanic soils (nitosol). These soils are deep and rich in organic matter. The remaining areas consists of clay soil or poorly drained soils (phaezems), red loams which are rich in iron nutrients (ferrasols) and sandy soils (acrisols). Within the valley bottoms is found the black cotton soils (vertisols)and organic peat soils (planosols).

Table 3.1 Soil types and their importance:

Soil type	Area	Land use	Importance
Nitosols	70%	Multiple cropping	Cash crops
Phaezems	20%	Multiple cropping	Cash crops
Terrasols	5%	Dairy farming	Grazing
Acrisols	2%	Valley swamps	
Vertisols Planosol	3%	Common grazing	Brick making

Source: Ministry of agriculture:

This is shown in the geology and soil maps, where most of the region is geologically occupied by volcanic deposits, some Basalts, Quarzites and cherts, and also Rhilites and tuffs. The soil map shows the various soil types in the region. The soils used to make bricks occupy approximately 3 percent of the whole region, that is the Planosols and the Vertisols.

3.1.8 Land use patterns:

Nyamira district has the advantage of having both

fertile soil types, which can be used interchangeably, and reliable rainfall. Mixed farming is widely practised. Most of the soils support crops such as coffee, tea pyrethrum, bananas, maize, finger millet, groundnuts, beans and an assortment of horticultural crops. In the valley bottoms where vertisols and planosols are found, and in swampy places, brick and tile making and pottery are the main economic activities.

The average farm holding size range from 1.4 ha to 2.2 ha. The average holding is usually 1.8 ha. According to a survey done by Kenya Rangelands and Ecological Monitoring Unit (KREMU) in 1983, 93 percent of the land in the district is devoted to the following uses; grazing/fallow, maize, bare ground, hedges, woodland, tea, roads/tracks/footpaths 3 percent). The remaining 3 percent is occupied by other major cash crops,buildings and bodies of water. Because of the population pressure on land these statistics have changed, though not significantly. For example, because of the need to feed the expanding population, more land has been put under maize cultivation. It is estimated that about 40 percent of the total land area is devoted to maize production. More than 50 percent of the total land area is under food and cash crops, showing that agriculture is the mainstay in the district's economy.

The district lacks grassland areas and forests of economic value. However, efforts are being made to leave hilltops unsettled to give room for forest development. Potentially these hilltops are useful for the planting of trees which can supply wood for various uses especially as fuel wood. Other efforts of afforestation in the district are frustrated by the local people who leave their animals to graze on the afforested area. The major energy source is fuelwood thus it is very important for increased afforestation programme for the increased [illegible]

3.1.9 Energy:

Wood energy in the form of fuelwood is the traditional source of energy which provides over 90% of total energy needs in the district and in the division. The demand for wood energy is growing especially with more uses being discovered for example brick burning where many trees are being used for fuel.

3.2 History of production of bricks:

The production of bricks has not been a popular activity in the past, however, it has been picking up. From the study it was established that the earliest production started in 1978. It again showed that ten years later, 57 percent of the producers had started

production. The number of producers has been on the increase year after year.

The producers who started the production of bricks after 1988 were 43 percent of the present producers. The increasing number of producers in this sector, shows that there is an increase in demand for the use of bricks in housing in the rural areas. This might also mean that there is a change from the use of other building materials such as mud, stones and concrete blocks to the use of burnt bricks.

3.2.1 Production processes:

The best soil for burnt bricks is a soil containing four parts clay and one part sand. This is usually found along river banks, in valleys or in the plains. The only soils which are not recommended are those containing a lot of sand, silt soil and black cotton soil. However, if there is any doubt about the soil the first step is to begin by testing it. This is actually what the small scale producers do before starting to do any process of production.

The first step is to collect a shovel full of sample soil from the chosen area. The soil is then crushed and carefully removed all the stones. Then some water is added to the sample and mixed thoroughly until the soil becomes plastic and can be moulded into different shapes with the hands. If the soil is

difficult to make into a shape or if it keeps falling apart, the soil contains too much silt or sand and cannot be used for making bricks.

The other methods used by the small-scale producers was the odour of the soil, it must be clayey. The feeling of the soil and colour were the common methods used to test the type of soil good for brick making.

3.2.2 Preparing the production site:

The area where the best soil has been found is prepared for use, the place is cleared of plants and grass, leaves and stones. In most cases the site for moulding bricks is made flat and is always within the source of the soil for transporting the soil to any far distance. The site for the kiln is sometimes prepared next to the source of the soil, the area is made flat and level for the kiln. The kiln place can be at the source of the soil or near to the collection site especially on the roadside

The ground is cut through to get the soil for brick making, stones, roots and leaves are removed from the soil. Water is added into the soil and mixed with feet to make mud. This mud is covered with grass and leaves. It is then covered for 3 to 5 days. The mud is ready for moulding when it has a heavy sticky feel.

3.2.3 Making Moulds:

The size of the bricks made is the same in the division. A hardwood is used to make the moulds. The moulds are made 1/2" bigger all round than the size of the brick required. A flat plywood is used to remove excess clay on the mould.

A heap of mud is taken from the pile, slightly larger than the mould, it is rolled into the mould, and this has to fill the mould completely. The cutting tool is used to cut off the excess mud. This excess is thrown back into the pile awaiting moulding.

The moulding is taken to the prepared drying area, the brick is pushed out of the mould using the piece of plywood, this will reduce the twisting of the brick [illegible] leaves the mould.

3.2.1 Drying the bricks:

The bricks are left to dry in the sun for as long as they have become hard. The bricks are turned on edge and are left to continue drying for about 7-10 more days. Bricks are protected from the rain while drying. Usually covers made from grass will be good enough but these are bricks left in the open air. Since the rains can be heavy the small scale producers have taken a lot of caution. One of the precautions is to wait until after the rains to start making the bricks again. The following methods were found to be

in use;

Table 3.2 Methods of storing of bricks by small scale producers:

Storing bricks	Percent
Open air	41
Permanent house	5.1
Temporary house	30.8
Under shade	23.1
Total	100

Source: Field survey 1992.

It can be seen that most small-scale producers dried their bricks in the open air. These were about 41 percent. This was found to be easy and cheap to most producers. Temporary houses made of grass thatched roof are mostly used, since about 30 8 percent of the producers had these kind of houses. Those who dried their bricks under shade were only 23.1 percent whereas few had permanent structures of iron sheet roofs, these were 5.1 percent. Because of the fear of the rains which temporarily stops production, better storage facilities should be encouraged so that production is continuous throughout the year. After drying which was taking up to 3 to 4 months, the bricks are taken to the kiln site which should be as close as possible.

3.2.5 Field Kiln:

The kiln prepared was depending on the number of bricks to be produced. Some producers were found to produce from 2000 bricks to 7000 bricks. The width of the fire tunnel was almost equal to the size of 3 bricks. The thickness of the wall between two tunnels should measure at least 7 feet front to back and 6 feet high, this is to make sure that the kiln is not made longer or higher than these measurements, the extra bricks will not get enough heat.

To retain the heat, the [illegible] covered by mud about 3-4" thick. The advantage of using this method is that the stack of bricks will be strong and stable. The bricks are arranged so that heat must pass easily to all parts of the kiln.

3.2.6 Roofing and sealing:

This is important to prevent heat loss. The roof is formed by placing the top layer of bricks together; One ventilation hole is left for each tunnel. The most common method of sealing dome is that of plastering, either by mixing cowdung with mud or by covering the finished mud plaster with a layer of cowdung. All the four sides of the stack are sealed with a layer at least 3-4" thick, the roof is not plastered at this stage.

3.2.7 Firing:

The firing of bricks changes their physical structure and gives them good mechanical properties and resistance to slaking by water. In firing bricks at the kiln, logs of wood are put into the tunnels from both ends until the tunnels are half full. At this stage the roof of the kiln is covered, leaving a ventilation hole.

More wood is added so that the fire burns strongly, the fire has to be kept burning for 4 to 7 days continuously, the fire cannot be let to die down. It gets attention every hour, day and night until the firing is complete, this will make the bricks strong.

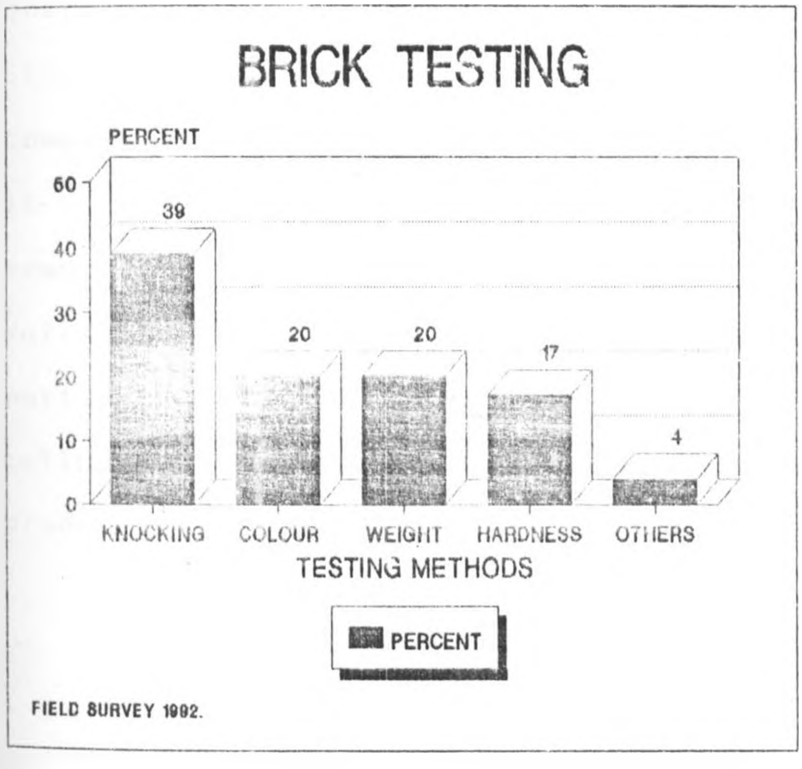
3.2.8 Testing bricks:

The purpose of testing is to check the production process; to remedy faults, to ensure a saleable product; and to guarantee the quality and performance of marketed bricks. Given the intended use of bricks in housing construction, they must resist local weather conditions and should not contain materials which will damage them or the applied finishes such as renderings, paints or plaster.

After firing, the bricks are tested, this is to make sure that the bricks made are strong enough to attract the buyers. Testing should therefore consist of ensuring that bricks have all the required

characteristics for use in building. With the small-scale producers, bricks are tested after 4-5 days of firing from the middle of the kiln and most producers used colour of the burnt bricks and tapping them together to make some sound that is a metallic sound. Some methods of testing used were as shown below.

Chart 3.1 Testing bricks:



Tapping, the striking of hand held bricks so that, if they make a high metallic sound then they are well fired, if they make a dull sound then that means they are not well fired and are of low quality. It can be seen that tapping was the common method used where 38.7 percent of the producers preferred to use it.

Colour and weight of bricks were also used. Bricks that are dark in colour are well fired and bricks that are light brown are not well fired, thus are of low quality. The method of hardness to test the quality of bricks produced used was were 17.3 percent of the producers.

3.2.9 Cooling the kiln:

When it has been ascertained that the firing is complete, the bricks are allowed to cool slowly. Slower cooling makes strong [illegible]. The kiln is completely sealed including the ventilation holes and it is left to cool for 10 to 11 days. The bricks are removed carefully to avoid breakages and arranged to wait for buyers to select them. Most producers were putting the bricks on the roadside for easy collection. Marketing of the bricks is done by the producers themselves to any potential buyers.

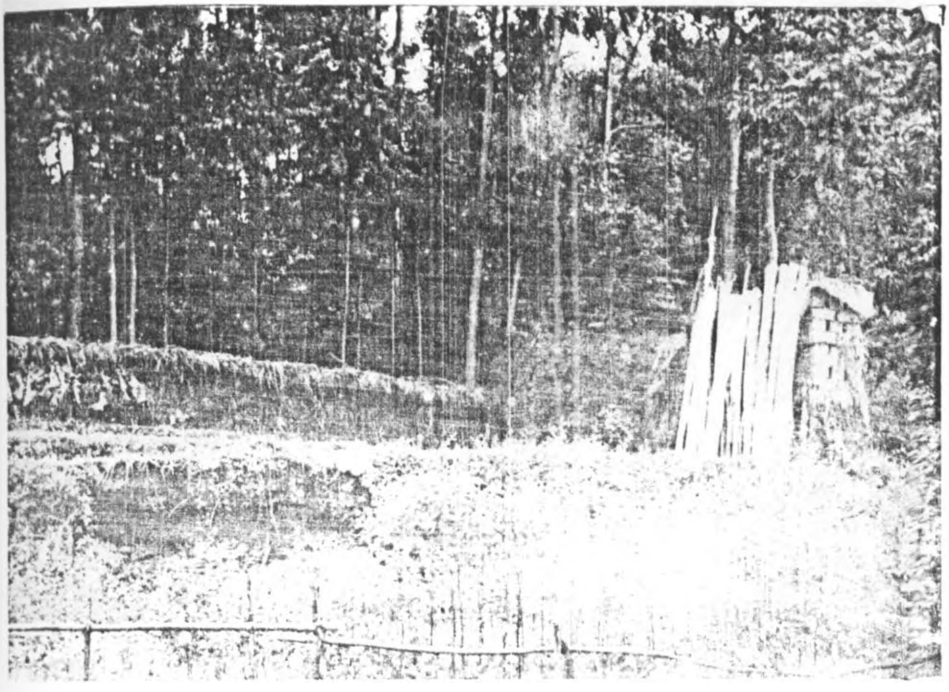


PLATE 3.1 Drying raw bricks under shade.

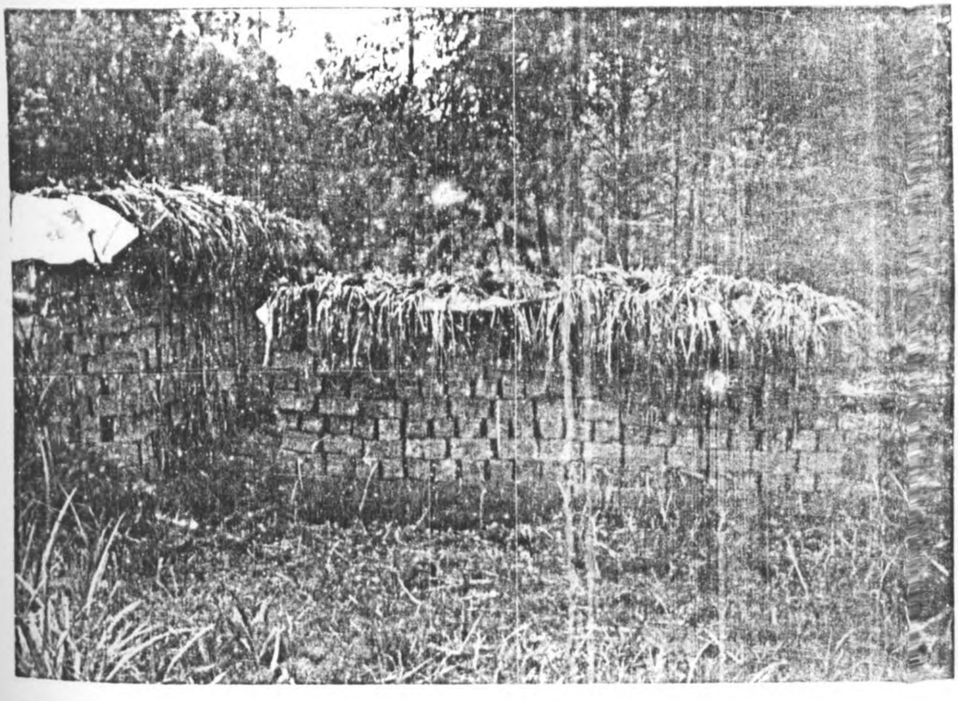


PLATE 3.2 Drying of raw bricks covered with grass.

PLATE 3.3 Bricks storage drying for burning later on.

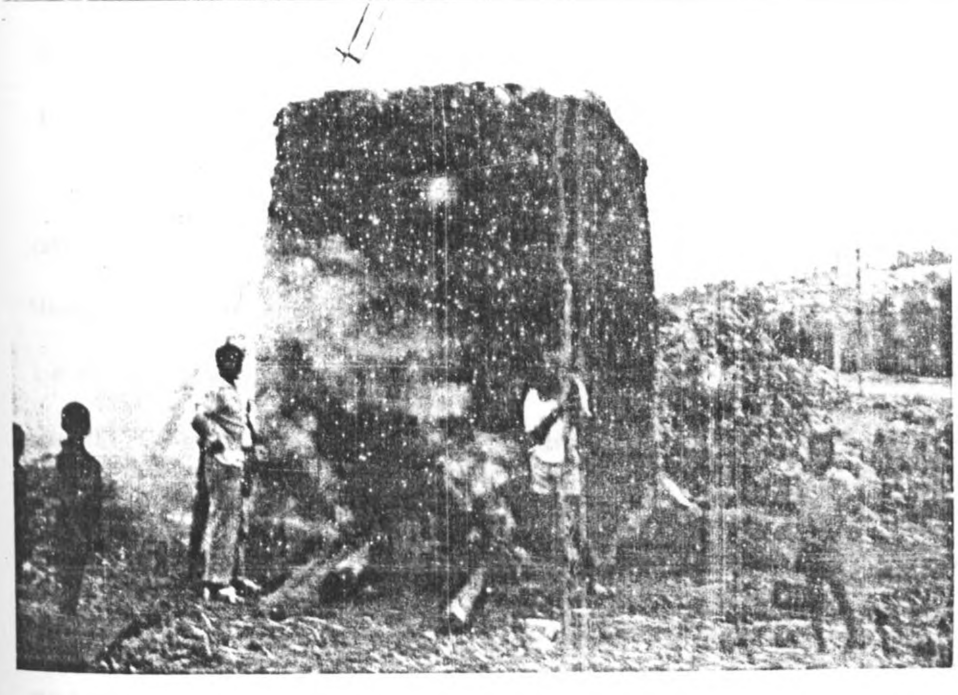


PLATE 3.4 Brick burning in the kiln, has 5000 bricks.

CHAPTER FOUR

4.0 ROLES OF SMALL SCALE BRICK PRODUCERS AND THE USE OF BRICKS IN HOUSING:

This chapter has two sections, the first section examines the roles of the small scale brick producers. The roles are in the terms of the development of the brick making industry in the of bricks for housing. The other roles are in terms of the economic gains form the production of bricks, the development of skills and employment. The second part examines the use of bricks in housing construction and a comparison is made between the brick, and non brick house owners so as to compare the quality of the house types.

4.1 Roles of producers:

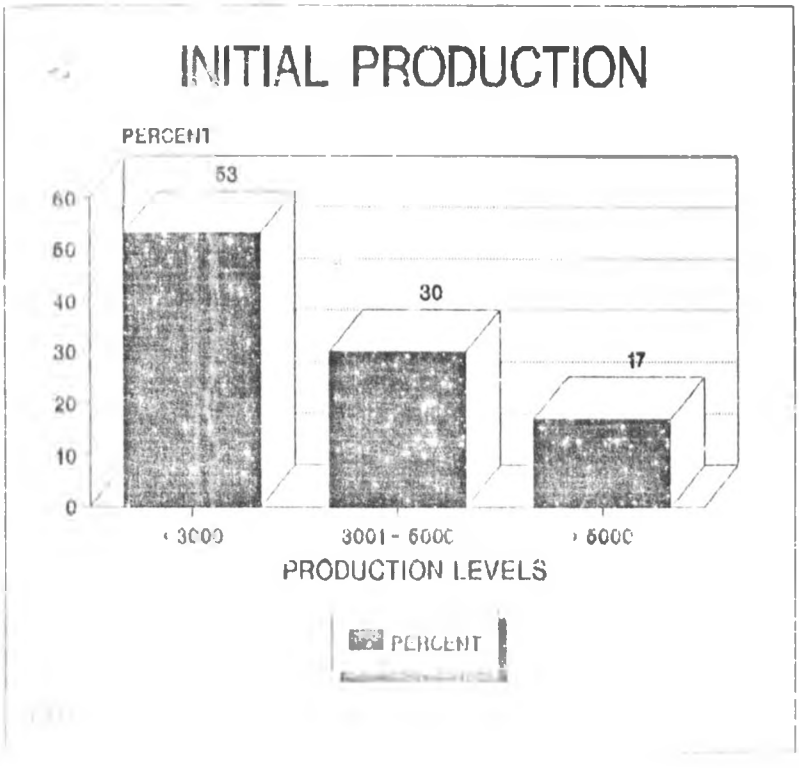
4.1.1 Provision of bricks for housing:

There has been a high degree of dependence on mud or adobe as a walling material for a long time in Manga Division. The use of the material is common because of it's availability and no cost involved in acquiring the material. There are however, various reasons which discourage most people from using this material, this is because the material is not long lasting, not attractive and can not be well maintained. People have been changing from the use of this material to other more permanent materials, but at a low pace. The other materials used for walling

include rough stones, concrete blocks, stones and bricks. In the 60s and 70s most people who used to construct houses using permanent materials were using concrete blocks and stones. The burnt bricks have started to be adapted in most rural housing constructions. The production of burnt clay bricks is mostly done by small-scale producers. Most of them started with very low levels of production output. Initial brick production by the small-scale producers was as low as 500 bricks and the highest was 8,000 bricks produced per year.

The number of bricks for a 5 roomed house take about 3,000 bricks. This implies that if the present production continue with production, then many houses made of bricks will be constructed. If a producer in one year produces 9,000 bricks then 3 brick houses are going to be built. However, the bricks produced are sold sometimes to people outside the Division.

Chart 4.1 Initial brick production:

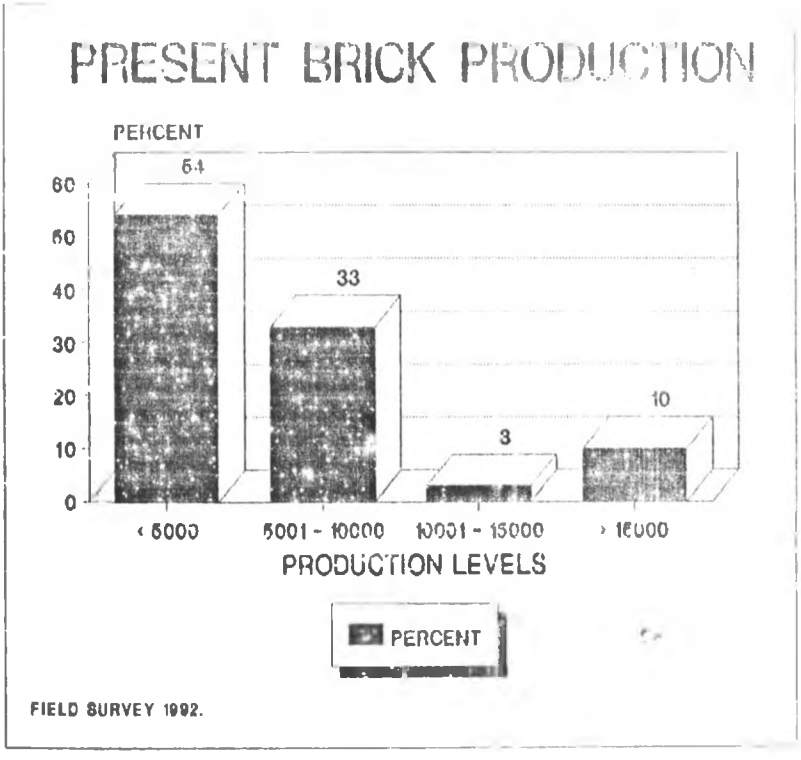


From the chart below it can be seen that from the small scale producers, 53 percent produce less than 3,000 bricks per year, showing that more than half of the producers were producing bricks enough for only one permanent house. Those who were producing between 3,000 to 5,000 bricks per year were 30 percent and those who started by producing over 5,000 bricks were 17 percent. This shows that at the beginning the producers had a low output. Most people who were constructing houses used to get the materials from the neighbouring divisions where brick production had started early. Initially production was only for own

use, and there were initially few producers to satisfy the local demand.

The small scale producers have now expanded their production and increased in number. They play a significant role in the provision of bricks for housing construction in the Division. The lowest production presently is 2,000 bricks per year, and the highest production is 36,000 bricks per year from one of the producers.

Chart 1.2 Present brick production



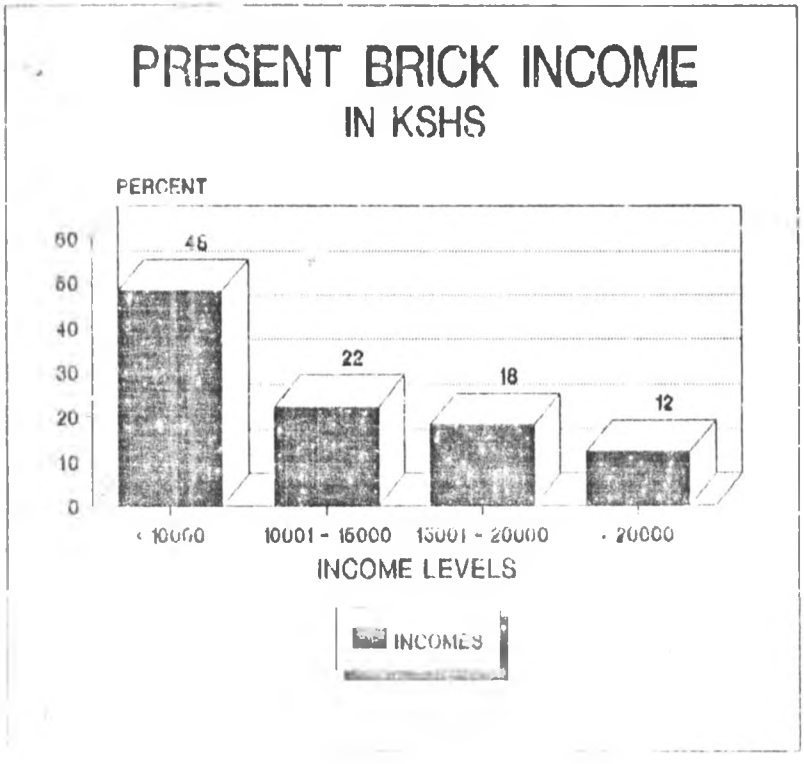
From the present output it can be seen that over half of the producers, 53.3 percent produce less than 5,000 bricks. In the past the same proportion of

producers were producing less than 3,000 bricks per a year. This shows an increase in the level of production. It can also be noted that 33.3 percent of the small scale producers produce bricks between 5,001 to 10,000 bricks. Those producing over 10,000 bricks are 13.4 percent of the producers. Whereas initially 17 percent of the producers were producing more than 5,000 bricks. This shows that small scale producers are playing a great role in the supply of bricks for housing construction in the Division, this is especially true as production is increasing.

4.1.2 Brick incomes:

From the study, 88 percent of the small scale producers were involved in the production of bricks for sale. The remaining 12 percent produce bricks for own use. This shows that production of bricks is mainly a commercial activity in the Division. There is an increase in income that the producers were getting from brick production. This is shown in the chart below.

Chart 4.3 Brick income



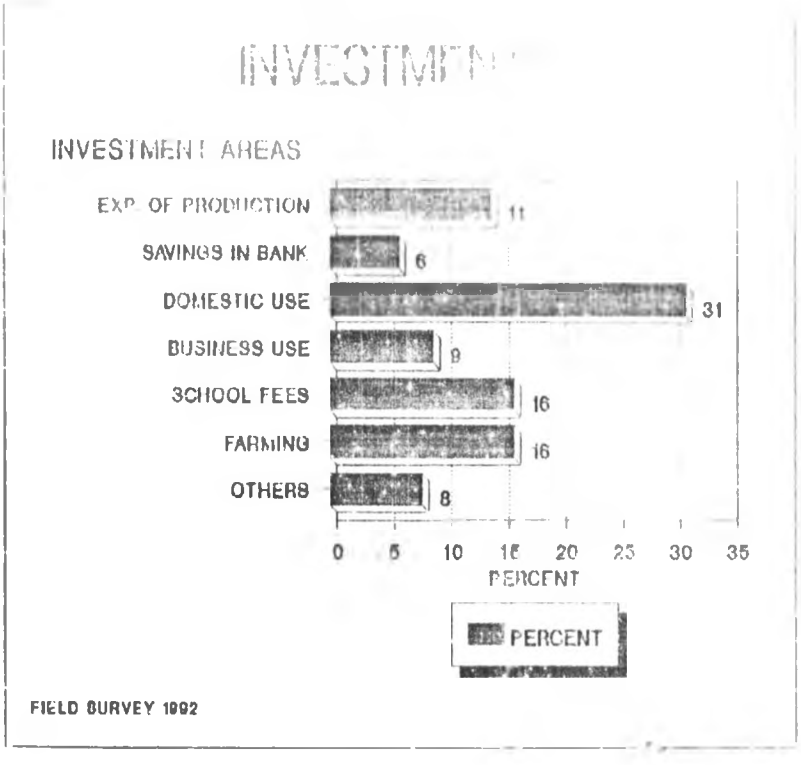
The lowest income per year from bricks is Kshs 1,000 and the highest is Kshs 90,000. It can be noted from the above chart that the a majority of the producers receive an income between Kshs 10,000 to Kshs 15,000 per a year and these were 48 percent of the produce" Those who received an income between Kshs.15,000 to Kshs 20,000 were 19 percent of the producers. For those who received over Kshs 20,000 they were 11 percent of the producers.

From this it can be noted that the production of bricks by small-scale producers has benefitted the small-scale producers. This means that the utilization

of local resources may lead to high levels of output, this might lead to an increase in rural incomes especially to the small scale producers.

Some of the areas where they invest their incomes include; expansion of production of bricks, bank savings, domestic financial needs, expansion of other businesses, paying school fees and for farming.

Chart 4.4 Use of brick incomes



The chart shows that a high proportion of income received is mostly to meet domestic financial requirements of the small-scale producers. This is because the average income of the producers is Kshs

1,400, and with the increase in cost of living this is a necessary source of income.

More than half of the small scale producers are farmers, but it is only 16 percent who spent their income from the sale of bricks on farming. A similar proportion of producers also spent their income in paying school fees. Those who spent their income for expansion of production constitute 13.9 percent. The proportion of producers who deposited the money in the banks was the lowest being 5.9 percent. This shows that the income received i[illegible] mediate financial needs.

The use of this income in starting other businesses or expansion of the existing business is taking place. This is because 8.9 percent of the producers invest their income in other businesses. The remaining 7.9 percent of the producers spent their incomes in areas such as community projects and fund raisings.

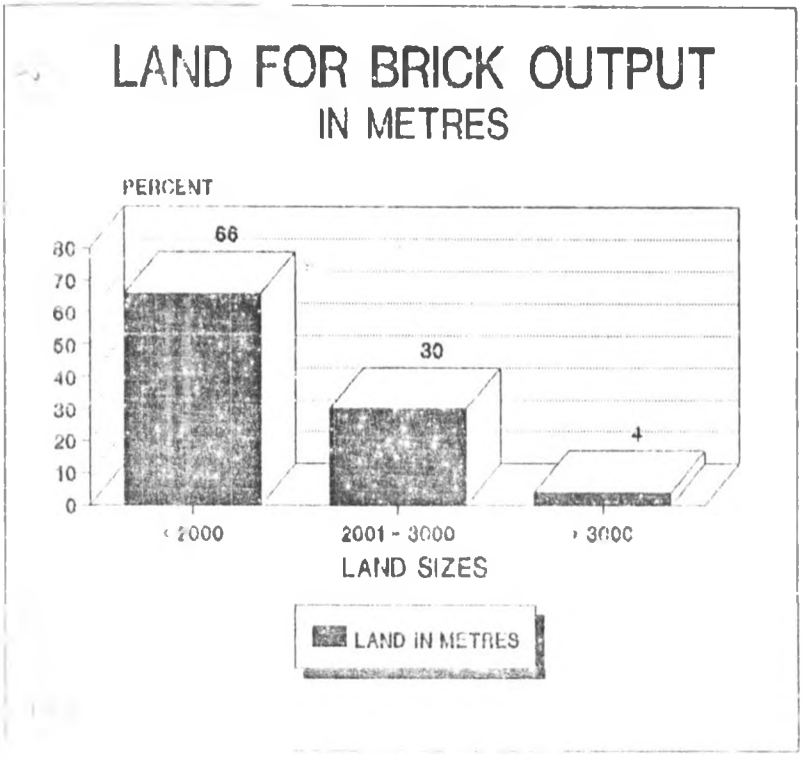
4.1.3 Use of wastelands:

The increase in population can be a great threat to the existing resources especially land. In Manga Division land has diminished with the high rate of population. Land seems to be the only potential resource for most people in the Division, at present the farm sizes are between 1.4 ha to 2.0 ha. Because of the need to feed the expanding population, more

land has been put under maize cultivation. The Division has the highest population density in the District with 747 persons per sq km. Thus, any land that is found to be unutilized is an asset to the family. The areas that are now being used for production of brick were originally thought to be wastelands and were not used at all.

Later as opportunities for brick production spread across the Division, these lands are found to be useful for brick production. It is discovered that the land under brick production ranges from less than 100 sq. meters to more than 5000 (1.02 acres). This is because brick production is regarded to be a good source of income, and it's use as a building material. The production of bricks has led to the use of a local resource that would have been neglected. Land size for production now is between 100 sq meter and 5000 sq meters (1.02 acres).

Chart 4.5 Land sizes for brick production:



It can be seen from the chart that 66 percent of the producers, have land sizes less than 1/2 an acre. The remaining 34 percent of the producers have more than 1/2 an acre of land under brick production.

Some producers hire the land for brick making. This is because clay soil is not found on their lands. The cost for hiring the land is Kshs 1,000, for making up to 10,000 bricks. The practise of hiring land started recently and is on the increase. This is because about 10 percent of the producers had hired land for brick making.

4.1.4 Development of skills:

The owner of a small-scale brick making project should have the necessary skills for brick making. The skills are required in various stages of production.

Manual digging of clay may be thought of as requiring no skill. This is, however, not the case as the careful choice of material at the pit face and mixing by taking vertical cuts, are essential to good brick making. An appreciation of the dip and strike of the clay, and the removal of projecting roots and stones, is also essential. The skills may be taught or obtained from on-the-job training.

Skills are also required for the preparation of the clay for brick making, and in appreciating the requirements of a good clay body. Equipment should not be misused and should receive proper maintenance.

Skills for moulding are essential to the making of good bricks. The hand moulder must know, for example, that the addition of extra water to the clay, so as to make moulding or extraction easier, will increase shrinkage and thus the risk of cracking. The hand moulder must have a "feel" for the clay, be able to go through it accurately into the centre of the mould, and produce well-formed bricks at a fast rate. An understanding of required brick quality will help the brick maker to maintain his mould or die sizes within the necessary tolerances allowing for shrinkage

on drying and firing.

Those responsible for drying bricks must understand the necessity for careful handling of the latter, especially before they are to turn bricks early in the drying stage. This is to allow the underneath to dry, and when they are dry enough for firing. These skills must be acquired on job training.

Firing bricks calls for great skill in order to get good and uniform product. The overall dimension and setting pattern of the brick in building up a kiln, and the spacing of the kiln, are very important factors. The rate of heating and cooling must be carefully controlled and calls for special skills in [illegible] on of various controls. This include temperature through adjustment of fuel feeding and draught. Skilled labour is needed for the sorting of bricks into various grades.

The production of bricks by small-scale producers is done with little skills. The brick making skills have been spreading fast and most producers have gained skills in the Division. There has been a development of appropriate skills for brick making in the rural areas. The training of the skills is informal and is spreading from one area to another. The above skills have been gained without going for a training. This is essentially because the activities are learnt at the production sites. Initially most of

the production used to have some waste due to lack of skills, but the present production has improved greatly because of experience in production. This means therefore, that brick making skills are developing and will be useful in building material production in the Division.

4.1.5 Labour Intensive production:

Skilled and unskilled labour are essential for the production of most building materials. For example, in the production of fired clay bricks, labour is required in mining the clay, mixing and moulding the clay, stacking and drying the raw bricks and firing the raw bricks to obtain the final product. There are several labour intensive techniques for production of bricks. These are particularly suited to the situation in most rural areas where there is surplus of labour co-existing with scarcity of capital.

The production of fired bricks by small scale producers requires abundance of labour. This is because production is done traditionally with no mechanization at all. It was found out from the study that sufficient labour was available within a short distance of 1 to 2 Kms. This is true because the brick kiln requires frequent attention throughout the day and night. In some countries brick making can be

interrupted temporarily during the agricultural peak seasons as the workers must return to their farms. In Manga Division the workers are always available because brick making is mostly done in the evenings when other work has been done. The production of bricks is never affected by labour scarcity and seasonality, except during the rains when production is not done.

Preparing the clay into moulds is done by labour intensive methods. The people employed take a lump of mud from the pile and put it in the mould, the excess [illegible] is taken to the pile awaiting moulding. [illegible] used to carry the mould to the prepared [illegible]

[illegible] a lot of work in the drying of bricks. [illegible] the work of labour in covering the bricks and turning the bricks until they dry. After drying they are taken to the kiln site for firing. Transportation is mostly done by women and children

The making of the kiln is done by some specialised people. This is another specialised part of the production process as it requires good planning. A total of about 10 people are used in the preparation of the kiln. Firewood transportation is also done by use of labour to the kiln. The burning of bricks is done for about 36 to 40 hours and it is continuous. During all this time people must be there

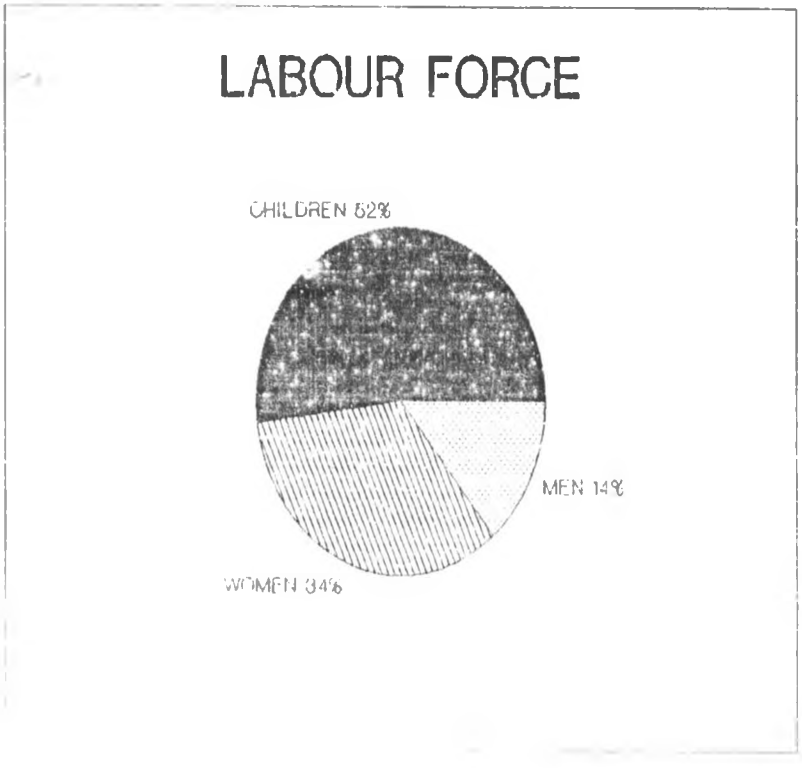
to feed the chambers with firewood throughout the firing period day and night.

From these processes it can be seen that brick making utilises labour intensive methods. This is because in all the processes labour is used. This is a production process which requires labour and it is available in the rural areas.

4.1.6 Labour force combinations:

Most of the labour force in the production process is hired. Most of the labour force is for transporting bricks for firing and to the collection site after firing, soil preparation and moulding. The distribution of labourforce is by children, women and men as shown below.

Chart 4.6 Labour force



[illegible] who use children for transportation are about [illegible] percent. This is because they find the children to be less costly, they could pay them 20 cts unlike women who could ask up to 40 cts per a brick for a distance of 1km. Children are preferred because they are fast[illegible]han the adults. Women account for 31.3 percent of the labour for transportation, second to children. Some producers were using men for brick transportation and these were 14.3 percent. Most producers complained that men were slow and expensive than women and children.

Table 4.1 Initial labour force employed

Initial labour	Freq.	%	Cum %
1	10	28.6	28.6
2	12	34.3	62.9
3	6	17.1	80.0
4	4	11.4	91.4
5	1	2.8	94.3
6	1	2.8	97.1
8	1	2.8	100

Source: Field survey 1992.
Total labour force employed initially = 87

Table 4.2 Present labour force employed

Present labour	Freq.	%	Cum. %
1	7	20.0	20
2	9	25.7	45.7
3	7	20.0	65.7
4	4	11.4	77.1
5	3	8.6	85.7
6	2	5.7	91.4
7	2	5.7	97.1
8	1	2.8	100

Source: Field survey 1992.
Total labour force presently employed = 111

During the initial stages of production the total labour force employed by the small scale producers was 87 people. Those producers who employed up to 3 people were 80 percent. The remaining 20 percent employed between 4 and 8 people. There is an increase in the total labour force. This is because the present producers employ 111 people, being an increase by 24 people.

The labour employed is either part-time or casual. Part time labour was 60 percent and casual labour 40 percent. With expansion in production more people may be employed in this industry. The labour force payment was according to the number of bricks produced. Payment was between Kshs 20 to Kshs 70 for 100 raw moulded bricks. However on average the mean cost is Kshs 16. From the study 10 percent of the labour force was costing kshs 50.

4.1.7 Use of appropriate [illegible]

Many countries in [illegible] countries are spending a disproportionate amount of their currency on importing building materials and technology. This deprives their economies of other urgently needed necessities. This observation has been made by (Habitat 1986). A severe bottleneck in meeting the shelter needs of the poor people in Africa, Asia and Latin America results from the fact that many countries fail to use local materials, or fail to rely on local technology.

Apart from the advantage of using local resources, it was also found out that the small-scale producers use locally available technology in brick making. The kind of technology they use is cheap and locally available hence appropriate. The application of locally available technology is important because

it can be an economic stimulant and is an obvious source of employment, economic growth, expanced production and thus leading to relevant shelter production in the locality where they are situated

Considering the capabilities of the people involved in the production of bricks and since they are all small-scale and have minimum skills the kind of traditional skills they have adopted fits them. This is because most of the producers have opted to use this type of technology. The technology requires little training, and is [illegible] The producers gave various reasons as [illegible] use this particular technology and why [illegible] it was appropriate to them. They gave reasons such as; the technology is cheap, locally available, labour intensive and easy to maintain.

4.2 Use of bricks in housing:

This section is focusing on the use of bricks in housing development. It starts with the architecture of the Abagusii and how it has been changing. Some comparison is made between the brick house owners and non brick house owners. Variables such as income, occupation, cost of house, and cost of building material are used.

The building materials constitute the main input in the construction sector, sometimes accounting for as much as 75 percent of the cost of a low cost house. The choice of building materials is important. This, to a large extent, determines the final cost of the unit. A wide range of building materials are produced by the informal/small scale producers.

There are specific local building materials which despite being potentially viable, have not had any impact at all, this is mainly because there are no standards and specifications and quality control in production (b) [illegible] ness in cost and (c) promote market acceptability in general. Standards for local building materials can hardly be separated from technologies for the production and use of those materials. However, one pre-condition to acquiring effective technologies is to have access to basic tools and equipments.

4.2.1 Modern architecture:

Though indigenous architecture is still common the Abagusii people are increasingly changing towards modern architecture. This is mostly pronounced in the northern part of the District. In the District, a number of people have constructed houses utilizing new materials such as Iron sheets for roofing, while the walls are either stone or brick. Modern architecture

is also developed where public facilities, such as administrative centres, educational centres or markets, are being built.

However, indigenous shelter has an advantage in that, the materials required for building can be obtained cheaply from the locality. The use of grass for thatching maintains the relatively cool conditions which may be required inside the house. A traditional house can be constructed in a homestead to offer adequate space for storage and for separate sleeping arrangements.

Conversely the construction of modern houses requires expensive materials such as iron sheets and bricks and need technically skilled labour. As a result a family may only be able to afford to construct one main house which can be shared by all members of the family. This is less satisfactory because it offers little in terms of storage space and the custom of separate sleeping quarters is lost.

It is universally recognized that success of any building programme depends on the availability of building materials. It should be of the right type, in the required quantities at the proper time and at affordable cost.

There are about four types of building materials that are being used in construction in Manga Division namely, wattle and daub (mud) rough stones, concrete

blocks and bricks. At present the use of rough stones and concrete blocks has been on the decline, people have started to substitute them with the use of burnt bricks. Bricks have proved to be cheaper and convenient to the users.

There has been an increase in the use of bricks for housing in Manga Division especially from early 1980s when the production of burnt bricks had also started to expand. Most permanent buildings that are being constructed use burnt bricks, this is well over 70 percent of residential construction. The use of traditional material in construction is still most common in many homes. This is especially for the majority of people who can't afford the use of burnt bricks. For the very low cost housing the traditional mud-walling material is used and this is well over 95 percent of the construction in rural housing.

4.2.2 Occupation:

The study found out that teachers were the majority of brick house owners. This is because 30 percent of brick house owners are teachers, followed by civil servants who are 20 percent. Whereas for the non brick house owners, 50 percent are farmers followed by teachers who are 25 percent of the non brick house owners.

Table 4.3 Type of house and type of occupation:

House type	Farmers	Teachers	B.men	C.servants	Others	Total
Brick	7	12	7	8	6	40
No brick	23	12	1	2	8	46
Total	30	24	8	10	14	86

Chi-Square = 15.1
Crammers V = 0.21

When a chi-square test of association was used, it was found out that an association existed between the type of occupation and the type of house one owns. The strength of the relationship was found to be 0.21, meaning that there is some relationship between [illegible] tion and the type of house build. Certain occupation were found to influence the type of house build, for example teachers and civil servants. However, the major reason as to why they were constructing brick houses is because of the increase in their house allowance from the owner occupier allowance scheme. This means that such schemes should be encouraged in rural housing development so as to have to improve on the quality of housing in the rural areas.

4.2.3 Incomes:

The average incomes for brick house owners and non brick house owners varied significantly. The brick house owners have an average monthly income of Kshs 5568 while the non brick house owners have an average income of Kshs 2119. This shows that in the Division high income people own houses made of bricks.

Table 4.4 Type of house and levels of income (Kshs) per month:

Type of house	[illegible]	[illegible]	[illegible]	Total
Brick house	3 8.3%	11 [illegible]	[illegible]	36 45%
Non brick house	21 47.7%	11 31.4%	9 20.5%	11 55%
Total	21 30%	28 35%	28 35%	80 100%

Chi-Square = 16.2
Crammers V =0.412

According to the chi-square test of association and crammers V shown above, there is a significant relationship between the level of income and the type of house. Those who had brick houses, and had an income of over Kshs 3,000 per month were 52.8 percent. The non brick house owners who had an income of less than Kshs 1,000 per month were the majority and were 47.7 percent. Income is significant in the construction of modern houses, this is because the cost of housing construction keeps on increasing.

4.2.4 Cost of Brick House:

The cost of constructing a brick house depends on other building components for the house. Brick house owners who spent less than Kshs 10,000 to buy bricks were 62.5 percent, and 37.5 percent spent more than Kshs 10,000. When it is compared with the total cost of the house, bricks cost less. The table below shows various costs of brick houses.

Table 4.5 Levels of Cost of house:

Cost of brick house	Percent
50,000	12.8
60001 - 100000	11
[illegible]	46.2
[illegible]	100

The cost of brick house costs Kshs 35,000 and the highest cost Kshs 300,000. The cost of bricks in most houses is about 12 percent of the total cost of the house. This shows that despite the low cost of bricks as a walling material, other building components for a house are costly.

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Table 4.5 Levels of Cost of house:

Cost of brick house	Percent
50000	12.8
50001 - 100000	11
100001	46.2
Total	100

The lowest brick house costs Kshs 35,000 and the highest costs kshs 100,000. The cost of bricks in most houses is about 12 percent of the total cost of the house. This shows that despite the low cost of bricks as a walling material, other building components for a house are costly.

Table 4.6 Cost of house and type of house:

Type of house	< 50000	50001-100000	>100001	Total
Brick	5 12.8%	16 41%	18 46.2%	39 45.9%
Non-brick	42 91.3%	1 2.2%	3 6.5%	46 54.1%
Total	47 55.3%	17 20%	21 24.7%	85 100%

Chi Square = 52.2
Crammers V = 0.603

It was found out that there is a strong relationship between the cost of house and the type of house that one owns. This is shown by Crammers relation strength of 0.603. It was also found that the cost of non-brick house was low as the majority of them were made with cheap locally available materials which are not durable such as grass mud and trees. To [illegible] brick house requires more fund than the traditional house construction whose cost is low. Other modern materials like iron sheets and stones are also used. Thus, about 91.3 percent spent less than Kshs 50,000 in constructing their houses, whereas at the same cost 87.2 percent of brick-house owners more than over Kshs 50,000.

Most people are adapting to the use of bricks as a walling material. This is because most of the non-brick house owners said bricks were a good material for housing. Those who suggested this were 93.5 percent, and the remaining 6.5 percent suggested other building materials such as concrete blocks and stones. They said bricks were long lasting, easy to maintain,

decorative, cheap and locally available. This again shows that the use of bricks in rural housing is being adapted and the industry has a potential in the future.

4.3 Quality of house:

The type of building material used reflect the quality of a house. This depends on whether the materials are of temporary or permanent nature. In rural Kenya, emphasis has been made in the use of modern building material [illegible] blocks, corrugated iron sheets, tiles [illegible]. Houses built with these materials are seen as being of high quality and reflecting the socio-economic status of the owners. They are therefore, viewed as desirable for the majority of the rural households.

While trying to assess the quality of brick houses, the study is not going to consider all aspects of a good quality house. The study will only take a few aspects to consider such as type of floor, roof, toilet and number of rooms. Due to the various meanings and attributes given to housing, a good quality house has been defined differently in different countries.

There are problems involved in attempting to measure, objectively as possible, the quality of housing in any given country or community. Attempts

in its measurements are further complicated by the social, economic and political realities existing in a country (Kiamba 1991).

Most other qualities of brick house and non-brick house were observed in the field. For example the outside compound where the non-brick houses were built, a bout 150 sq.meters to 200 sq.meters, while brick house were 250 to 300 sq.meter compounds. There was also good drainage for brick-houses unlike non-brick-houses. The large compound for brick-houses had flower beds. The other aspect was the use of water tanks build with brick. These were found mostly owned by brick-house owners up to about 30 percent of them. While for non-brick house owners those with brick tanks were 10 percent the rest had mostly drums for the collection of rain water.

4.3.1 Type of roof and type of house:

Table 4.7 Material used for the roof and house type:

Type of house	Grass	Iron-sheet	Tiles	Total
Brick	-	35 87.5%	5 12.5%	40 46.5%
Non brick	9 19.6%	37 80.4%	-	46 53.5%
Total	9 10.5%	72 83.7%	5 5.8%	86 100%

It was found out that 87.5 percent of brick house owners had corrugated iron sheets as a roofing material, while for non-brick house they were 80.4 percent. There were also 12.5 percent brick house

owners who had brick tiles as a roofing material, there was none for non-brick houses. Those who had grass thatched were 19.6 percent of the non-brick house owners, while there was none for brick houses.

4.3.2 Floor type and house type:

Table 4.8 Type of house and material for the floor:

Type of house	Earth	Concrete	Timber	Total
Brick		39 97.5%	1 2.5%	40 46.5%
Non brick	33 71.7%	12 26.1%	1 2.2%	46 53.5%
Total	33 38.4%	51 [illegible]	[illegible]	86 100%

From the table it can be noted that 97.5 percent of brick houses used concrete as a material for the floor and 2.5 percent used timber. Whereas 71.7 percent of non brick house used simple earth material for floor, 26.1 percent used concrete, while 2.2 percent used timber.

4.3.3 Number of rooms and house type:

Table 4.9 Type of house and number of rooms:

Type of house	< 4	5 - 7	> 8	Total
Brick	13 32.5%	20 50%	7 17.5%	40 46.5%
Non brick	37 80.4%	9 19.6%	-	46 53.5%
Total	50 58.1%	29 33.7%	7 8.2%	86 100%

The study revealed that most brick houses had 5 to 7 rooms and these were 50 percent, while for the non-brick house owners who less than 4 rooms were 80.4 percent, and 19.6 percent had more than 5 rooms. This shows that most people who had brick houses have more rooms unlike the non-brick house owners.

4.3.4 Toilet type and type of house:

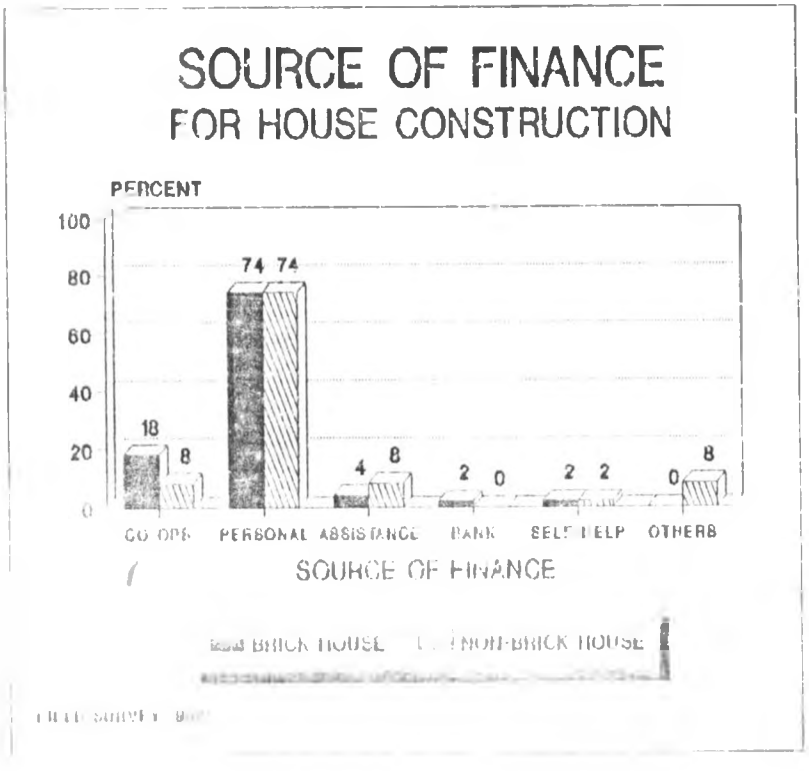
Table 4.10 Type of house and type of toilet:

Type of house	Mud	Bricks	Timber	Total
Brick	-	32 80%	8 20%	40 46.5%
Non brick	23 50%	4 8.7%	19 41.3%	46 53.5%
[illegible]	[illegible]	36 41.9%	27 31.4%	86 100%

Most brick house owners have good quality toilets, this is because 80 percent had brick build toilets. The remaining 20 percent had timber type of toilets. While for non-brick house owners 50 percent of the toilets are made of mud walls, 41.3 percent made of timber and only 8.7 percent had toilets made of bricks or concrete blocks. Thus it can be seen that good toilet types are owned by brick house owners. This may also be supported by high levels of drainage observed with the brick house owners.

4.4.5 Source of finance for housing construction:

Chart 4.8 Type of house and source of finance for construction:



From the chart above it shows that personal savings was the major source of finance for most housing developments. Brick house owners with personal savings as the main source were 74 percent with a similar percentage of 74 percent with non-brick house owners. This means that if there were other sources of financing more people would construct better houses. There are no rural housing loan schemes operating in the divisior which can encourage many people into better quality of houses such as brick houses.

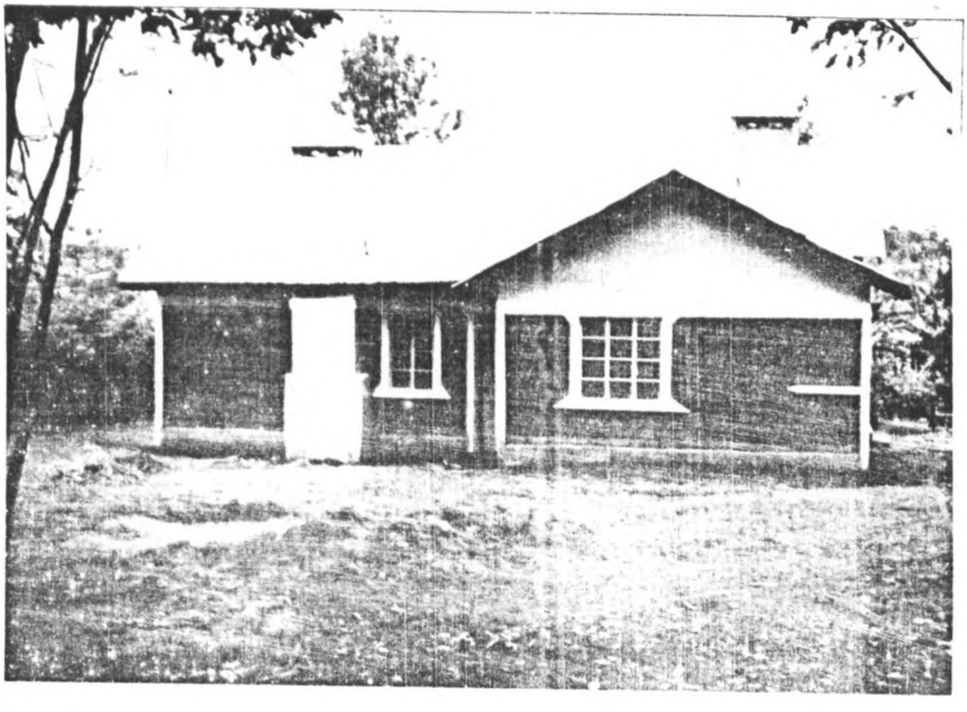


PLATE 4.1 Modern residential house made of bricks.

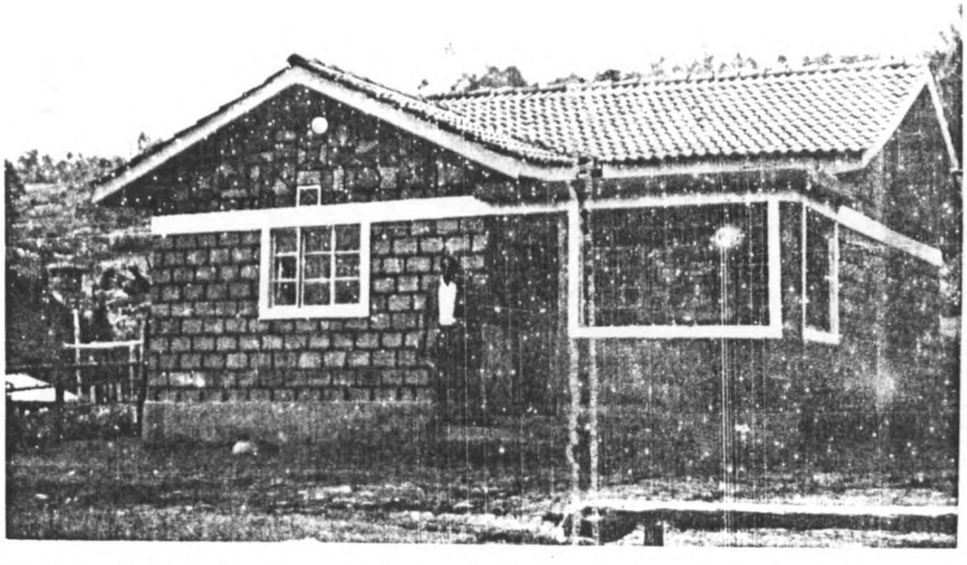


PLATE 4.2 Rural residential house built with bricks.

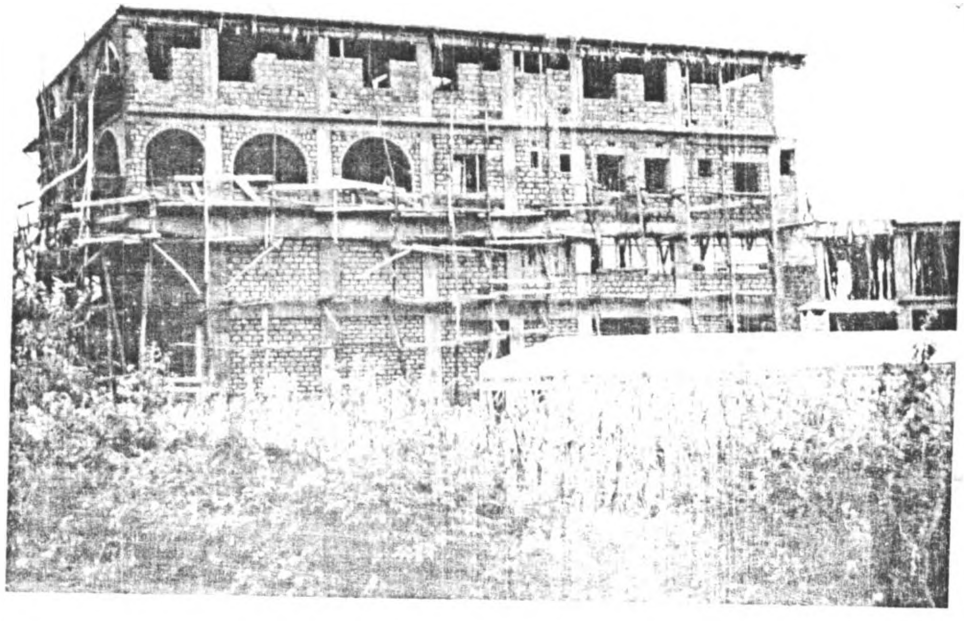


PLATE 4.3 Commercial storey building made of bricks.

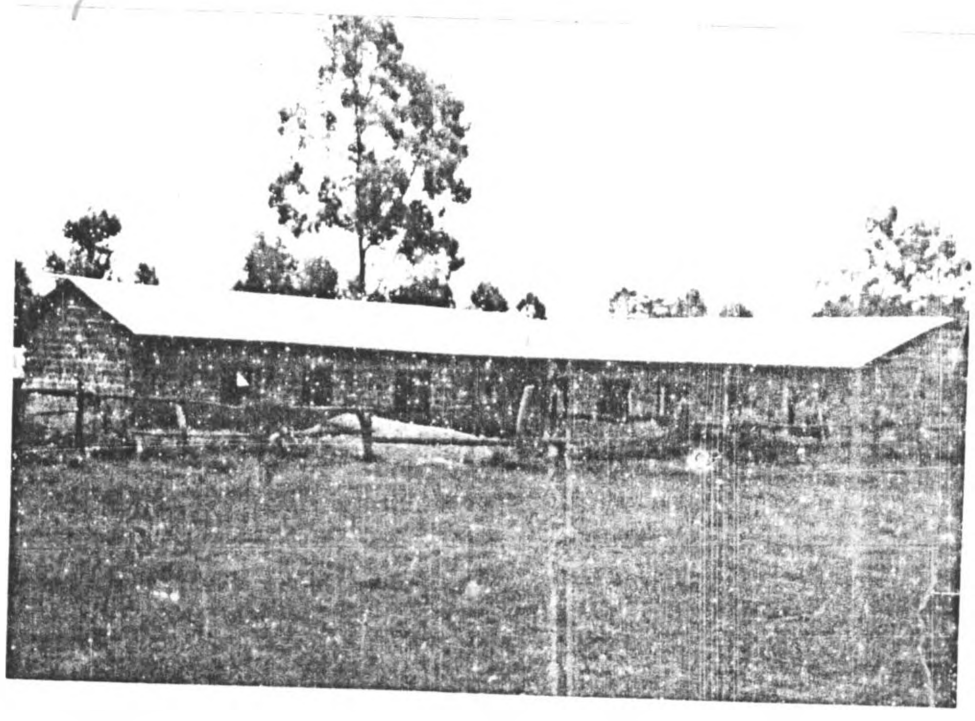


PLATE 4.4 An institutional building (school) with bricks.

CHAPTER FIVE

5.0 CHARACTERISTICS AND CONSTRAINTS OF SMALL SCALE BRICK PRODUCERS:

This chapter is divided into two sections, the first one being on the characteristics of the brick producers and the second part is on the constraints that the small scale producers face in the brick making industry. The various characteristics of the small scale producers are examined in this section. The characteristics are in terms of organisation, management and technology. It also examines some of the problems that face small scale producers in the brick industry.

5.1 Characteristics:

5.1.1 Source of Finance:

An investor would like to have full knowledge of raw material deposits, and the suitability of the material for processing. This often involves extensive pre-production tests which are costly, and normally a small-scale entrepreneur has limited sources of funds for such undertakings. However, overall capital requirements for the production of most indigenous building materials are relatively low and can often be met within the limitations of the small scale producers.

There are three major sources of finance, namely personal savings, assistance and self-help. It was found out that 79 percent of the producers started the operations out of their own personal savings. The use of personal savings to start production shows the low levels of capital requirements. The other source of finance is by assistance which was about 8.8 percent.

The other source of finance which is quite common is self-help financing, this was 36 percent of the producers. This was a source especially from organized self-help groups giving members some money to set up their own business. This form of funding has started to gain some dominance on small scale production of bricks.

Initial capital in small scale production of bricks is not very high as very simple technologies are used and this do not require a lot of financing. The small scale production units, by the nature of their establishment, are suitable for the shelter needs of their regions. They have a very minimal capital investment requirements. Utilize small deposits of raw materials, depend upon simple technologies and local market requirements, generate employment and provide substitutes for imported materials, they have positive effects upon sub-national development.

The starting capital is as low as Kshs 200 and the highest is Kshs 5,000. The small scale producers who started with less than Kshs 2,000 were the majority, these were 85.2 percent. Those producers who started production with more than Kshs 2,000 were 14.7 percent. This calls upon a high level of encouragement for such units so as to increase the level of brick output in the building and construction industry in most parts of the rural areas.

5.1.2 Size of establishment:

Perhaps, more than anything else, the smallness of the establishments constitute the major characteristics of small-scale production units in the building materials sector. This was true because 88 percent of the producers had an output of up to 10,000 bricks per annum. Again the number of people employed were on part-time or on casual basis and this shows that the establishments are not big enough to offer better terms.

5.1.3 Local base:

The other characteristic is that they are deeply rooted in the locality; their raw materials, labour, energy and market requirements are provided within the immediate catchment area. They are localised because of their adaptation to limited natural resources

endowment of their localities. Again most of the small scale producers establish in response to local market demands. This is true because the extent of the market is within the District and the surrounding localities. The labour used is from the local areas and none comes from outside the locality. Finally, most of them derive their energy source from non-conventional local fuel and in this case, fuel-wood.

5.1.4 Lack of specialization in managerial function:

Most of the small [illegible] units are actually family undertakings established that in all production units, one [illegible] handles all the decisions. He is responsible for the general management and marketing of the bricks. The establishments are small and do not require specialised managerial abilities. Most of them have individual owners controlling all the undertakings in the brick making processes.

5.1.5 Lack of standardization and quality control:

Small scale production units in the building materials sector are among the establishments where product standardization and quality control are most relaxed. In fact there are no quality control procedures to guide small-scale producers.

It was very clear that in all the establishments of the brick burning units, the operators were not aware of any standards or quality requirements. Most producers were setting their own quality of products or using other producers products as a standard measure.

The major constraint to the development of indigenous building materials is lack of standards and specifications for such materials. This means that there is no practical way of maintaining quality and improvement in production.

5.1.6 Lack of technical know how:

Most small-scale production units do not have skilled labour and always rely on traditional methods of production. It was found, for example, that in brick making there can be prolonged drying period which may be due to the local weather or the nature of the clay. No attempts were made to solve such problems but they took it as a normal condition. Under such conditions, lack of technical know-how adversely affects productivity. There is no production during the long rains. This is because the small scale producers do not have an alternative way out of such a situation.

5.1.7 Lack of production records and data on cost:

All the production units surveyed did not have production records and data on costs of inputs, sales, or revenue. Product costing and production record keeping are two vital management functions. However, the owners of these units depended upon their memories to account for sales and purchases. A small proportion of 10 percent of the producers kept rudimentary records of costs and sales, but the data is not well organized. As a result it was very hard to know how much profit the made.

5.1.8 Lack of maintenance and repair facilities:

The facilities owned by most small-scale producers are cheap and rudimentary and rarely do they repair them. The only facilities that need maintenance are the stores for keeping the raw bricks most of them are not permanent and are not well maintained when there is no production. Other than the moulding boxes, jembes and pangas there were no other facilities that needed repair.

5.1.9 Income level of producers:

Small scale producers of bricks are generally people of low income earning group, and this seems to be the reason as to why they opt to do some extra work which can supplement their incomes. It was found out

from the respondents that the lowest income was Kshs 250 per month and the highest was Kshs 8000 per month, but 91 per cent of the producers earn up to Kshs 3000 per month. Those who earn less than Kshs 1000 are 50 percent and those earning between Kshs 1000 per month to Kshs 3,000 per month are 40 percent and finally those earning over Kshs 3000 per month are 10 percent of the producers. On average the mean monthly income is about [illegible] higher as compared to the [illegible] of Kshs 700 in the rural are.

5.2 CONSTRAINTS FACING THE SMALL SCALE PRODUCER:

This part is to deal with the problems the building materials producers face in the production of bricks. Each of the constraint is dealt with at length. The constraints are examined according to the information obtained from the producers.

5.2.1 Production methods:

Small-scale production units in most localities are an adaptation to limited natural resource endowments at dispersed locations. Quite often raw materials exist in volumes which do not justify large-scale production but would be economically processed by small-scale producers. Examples of such raw materials include clay, limestone and gypsum as well

as limited reserves of natural fibre. Because of economies of scale the small-scale producers could thrive more on such limited deposits to satisfy local demands.

In trying to meet the local demands of building materials it was found from the study that the brick producers are affected by the technology they employ in their production units. Primarily the establishments are labour intensive as opposed to capital intensive. The kind of technology employed by the producers is basically [illegible] and all the production processes are labour oriented.

Bricks are bulky materials to be carried over long distances. Their market is still limited to their locality. Those producers who produce for sale are finding it difficult to transport bricks to distant places because of fear of breakages.

In spite of the positive contributions of the brick producers they were still found to be facing several problems ranging from technology and quality control to ineffective marketing of their products.

5.2.2 Lack of information:

Most of the small-scale producers of building materials lack essential information regarding production techniques and market potentials of their products. In some establishments, the owners are

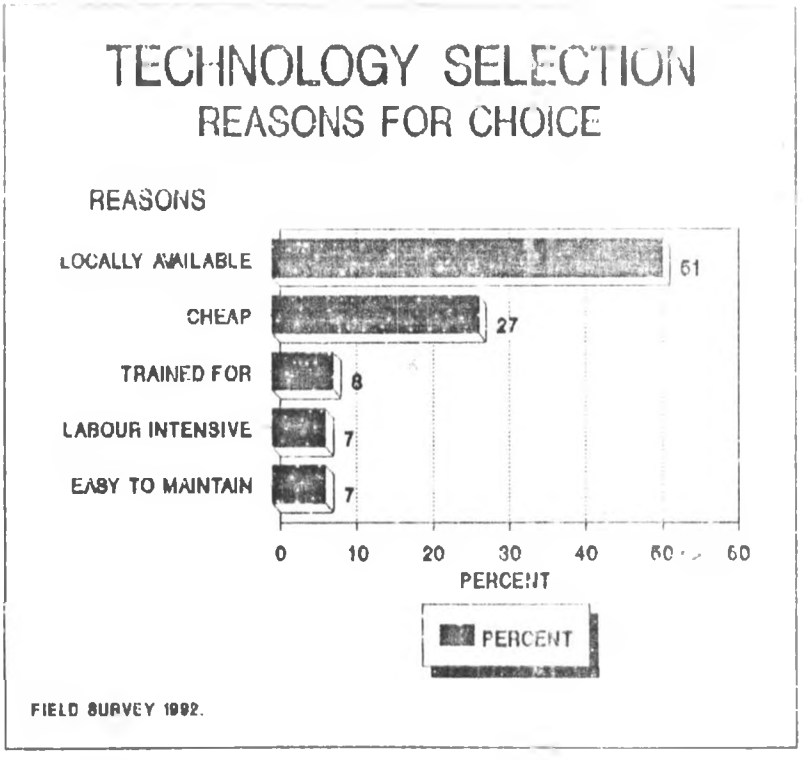
illiterate with the result that they do not benefit from technical literature. This is evident from the problems the materials producers faced especially on choosing the right type of soil and other information on building material types.

From the study it was clear that the brick producers in the rural areas do not receive any technical information on the production of bricks. In fact it is only about 8.6 percent of the producers who indicated that they receive some technical information from the Lake Basin Development Authority (LBDA) which disseminates such information. The authority has installed a roofing tile factory in the neighbouring [illegible] limits, thus the producers may seek some [illegible]. The rest of the producers up to 91.4 percent did not get any information on the production of bricks. The producers do not get suitable information materials (documents) on the various production techniques available to them. It was also found out that about 58 percent of the producers had at least primary education and the remaining 42 percent had secondary education up to form four. Thus, it is true that certain technical information on brick making may not be easily understood. On marketing, small-scale brick producers are very passive. The result has been that they are unable to make known their products to potential customers.

5.2.3 Inadequate technical and managerial skills:

The inability to solve simple production problems provides an indication of lack of technical know-how among the small-scale producers of burnt bricks. This apparent failure is considered as a major characteristic of small-scale brick producers found in most parts of a developing country such as Kenya. There were various reasons given by the producers as to why they chose the type of technology as shown below.

Chart 5.1 Technology selection



From the study it was established that 51.6 percent of the producers chose the technology because it was the only one available to them. A small proportion of 17 percent of the producers chose it because it was cheap to undertake.

Despite the reasons given, the producers still face technical and managerial problems. The kind of production that is being undertaken is quite traditional as the simple tools are found to be in constant use, making innovation of technology a slow process. One of the reasons for the limitations for the production of local building materials has not been widely taken up is that there are various gaps in the transfer of technologies. The commercialization of indigenous innovations for the production of local building materials.

The producers of bricks complained that they had some technical problems in the production of their bricks. About 60.8 percent said they faced a problem of the technique being costly to use in terms of energy requirements, land availability, transportation and labour-input. There were also some who had the problem of lack of training for the use of the technique and they were 15.7 percent. The other remaining producers complained of problems such as, lack of information, inappropriateness and these combined were 23.5 percent

The managerial skill of most small-scale producers is just a one man show. the success of any production unit depends upon the simple managerial ability of the individual producers. Most of the producers do not have high managerial skills but seem to be improving every time as they keep expanding their production. This is a'so true because a small number of producers up to about 10 percent are now keeping some records.

Most of the producers are [illegible] for sale. The technologies [illegible] proved and above all,be widely known [illegible] for sustainable production. The [illegible] actual development and commercialization of newly introduced technology is complex and resource consuming. This is a deterrent to promotion of innovative technologies. The technical development of the indigenous technolo[illegible] should be strengthened and also it should be improved to fit into the changing requirements of the products that are produced. Small-scale producers should be have a constant evaluation of their technology. Lack of all these has been a hindrance to technological development in brick production.

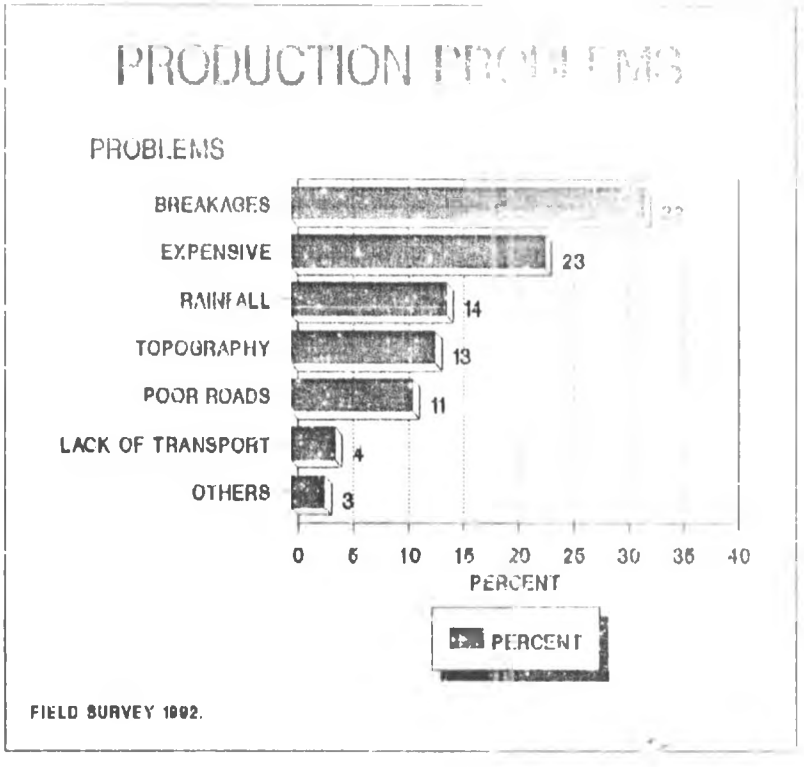
5.2.4 Transportation:

The transportation of building materials must be considered first before production takes for any material produced. The cost of transportation of raw and finished materials must be considered. The mode of transport whether it is through animal traction, human labour or motor vehicles should be considered first. The type of roads and the physical background of the area where production is taking place should also be taken into account.

Small-scale brick [illegible] labour and animal traction as forms of [illegible] about 92.1 percent of the producers used human labour for transporting both finished and raw bricks to the sites where they are required. The remaining 7.1 percent of the producers used animal traction to transport to the production sites. Transportation of the bricks is to the kiln and from the kiln to the collection point for buyers. The producers do not transport to the buyers, it is the buyers who arrange for transportation to their areas of requirement. The cost of transportation by the producer is mainly to the collection site. It is the cost of the buyer to transport the bricks on his own. For a distance of 5 kms the cost of transporting 2,000 bricks by a vehicle is Kshs 500. The longer the distance the higher the cost of transportation.

The problem of transportation is experienced by both the small-scale producers and also by their customers. The producers mostly complained of about six major problems affecting them, this range from cost, topography, climate, breakages, poor roads and lack of vehicles.

Chart 5.2 Production problems facing small scale brick producers



The problem of breakages of bricks is due to poor handling during transportation. The risk of damage is increased particularly if transportation is on rough roads. The problem of breakages was also complained of by brick house owners where bricks used to break

while being transported on the rough roads. However, the problem is reducing as roads are getting improved in the division.

The other problem the producers face is that of transporting both raw and burnt bricks to their required site is expensive. They have to hire labour to transport raw bricks to the kiln, after the bricks are burned they also have to hire labour to transport the bricks to the collection point on the roadside. All this is an expensive venture especially for those producers who [illegible] from the main roads, that is by about [illegible]. [illegible] producers complained about the high cost [illegible] station. Transporting one brick from the kiln about 2 km to the main road costs 10 to 20 cts for a distance of about 1 km.

The frequent rainfall in the division make, transporting of bricks a problem, about 11.3 percent of the producers complained about rain. This is because there is no transportation which can be done during the rainy season. This affects the sale of bricks during the rain season. Raw bricks can not be transported at this period because they absorb a lot of water and become heavy, they are kept under shade or in the open where they are covered with river lire grass.

Topography is also a problem to the small-scale producers in transporting the bricks. This is because the Division is generally hilly with several folding hills. Most of the roads are on the hills, making transportation some times difficult. The production sites are found on the plains and the collection sites are next to the roadside. If there are hills then the producer is charged more to transport the bricks to the road side.

The state of roads is also a constraint in the transportation of bricks. The few main roads in the [illegible] on the murram and also other rural access roads. These roads are not easily passable during the rain [illegible] not all weather roads.

5.2.5 Problem of Quality:

Small scale production of bricks are small scale establishments where product standardization and quality control are most relaxed or do not exist. Low quality products are common in most areas of small-scale production in the area of study. Whatever the technique adopted, quality may be improved and costs reduced, if appropriate measures are taken during the production process. Experience shows that a large number of bricks are often wasted during the various production stages. For example, moulded bricks get eroded by rain before firing or distorted by bad

handling methods. With attention to the basic principles of brick making and more care, a greater number of bricks could be produced for the same expenditure on labour, raw materials and fuel.

It is recognized that one of the major constraints to the development of indigenous building materials is the lack of standards and quality control. Certain control measures in the traditional sector can be an effective means of ensuring quality of production and cost reductions in this sector. This is likely to increase demand for indigenous building materials.

The small-scale production of bricks is done [illegible] specification to standards that are formally known they are also done without any form of quality control. Most of the production units are started by individuals who have no basic training on brick making. They start without consultation to any specific concerned person(s) since these people are not available. Sometimes the moulding of bricks might be done by poor grading. This means that once the bricks are taken for burning most of them are wasted, do not burn, break or are of low quality.

The problem of quality control is only done by the producers themselves, who always are convinced that the kind of bricks they make are of best quality. The producers do not have any form of guidance on how

to make good bricks as most of them start the production by being influenced by others. Some producers make bricks and when they know that they are of low quality they sell to customers who also do not know the good quality bricks, only to be disappointed when they start giving them problems. It was also found out that some buyers also know how to determine the best quality bricks and these are safe from the ignorance of quality. The consumers who could determine the quality of the bricks were 60 percent.

The brick [illegible] to be differing from one place to the other, some of its were of big size and some of fairly small size. It was very hard to determine which size is the right one but most of the producers preferred the small size of 7"x9"x1" which was in high demand than the other sizes.

The quality problem emerged from the fact that most initial stages of production such as soil determination is done with very little technique of determining the best soils for brick making. In general, the quality of bricks produced will depend on the choice of an appropriate technology, given the fact that raw materials will vary in their characteristics from one location to the other. For the best products of bricks some standards should be adapted to the local situations. All producers were not aware of any quality controls that are required

for bricks and were making the bricks that they thought their buyers could appreciate. Quality control and standardization may benefit both producers and users, it needs some serious consideration for effective use in the production of bricks.

5.2.6 Rainfall:

The production of bricks is not a continuous process in Manga Division. This is because it is mainly interrupted by the heavy rainfall during certain months of the year. In the rainy season there is almost no production, if on it is minimal. If bricks are made during this period, it is not easy for them to be well moulded and the making of the kiln and firing is not easy during this season. The bricks that are not dry during such a period have to be well protected to avoid any damage by the rains.

The period between march and May are rainy months so there is no brick making taking place. During such a period the bricks are kept to dry. Most small-scale producers have no solution to this problem, but to wait until after the rains to start production. The level of production is thus affected because production is not continuous throughout the year. Most producers may prefer to produce more than once in a year, but the rains affect their producing. The bricks also do take a long time to dry before being taken for

firing they take up to 3 to 4 months before firing, this is because the bricks are not kept in good areas or stores where they can dry fast after the rains.

5.2.7 Marketing and pricing:

Brick making by small scale units have an advantage of being able to locate close to the market points, so that the final product does not have to be transported over long distances. If indigenous building materials are to lead to improvements in supply and cost of basic items, one important criteria is for systems which can be brought on the production line in the shortest possible time.

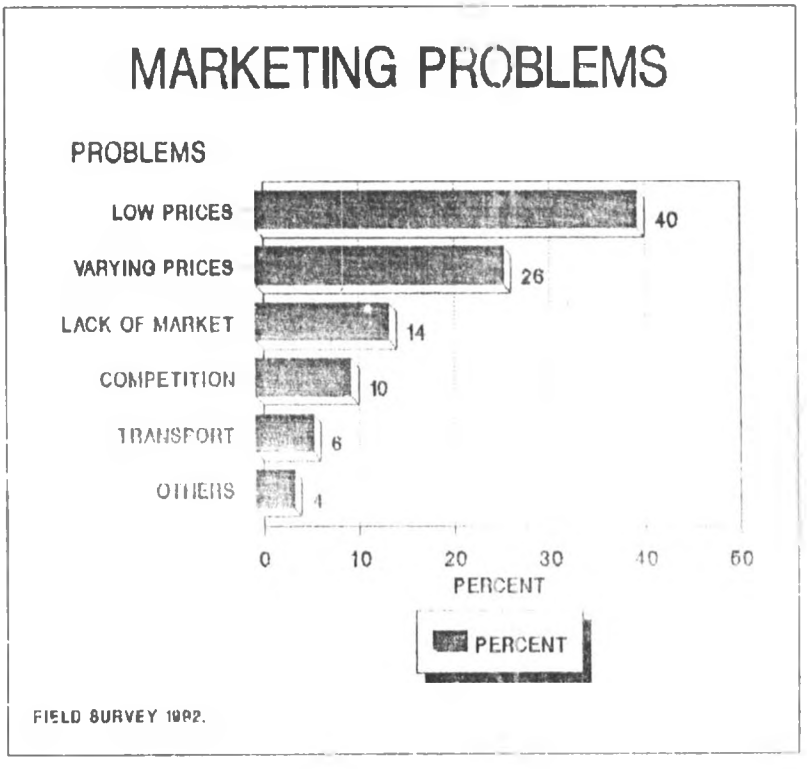
marketed after they have been sorted into different piles according to their qualities. Bricks are sold at a lower rate during the brick making season than when they are not fired. There is aways price fluctuation with the sale of bricks. This has also been found to be the case in India as indicated by Gandhi (1986).

The marketing of bricks is normally done by each individual producer and this has not been very easy. What most producers do is to send out people to look for customers and whoever is ready can buy the bricks. The marketing is done immediately the bricks have been sorted out and have been counted.

The other method the small-scale producers use is to put the bricks just on the roadside so that they can be seen by potential buyers and whoever is ready can buy them. This has not been very easy as some of them have found that their bricks take long to sell and they do not know what to do over this period.

The prices of the bricks depend on the demand and the season when the bricks are produced. When the demand is high one brick costs Kshs 4 and when the demand is low one brick costs Kshs 2. During the rainy season the prices are higher because there are few producers and also vice versa. In marketing the producers complained of the following problems, lack of [illegible] prices, fluctuating prices, competition for their materials, transport and others, this is shown in the Chart below.

Chart 5.3 Marketing problems facing small scale brick producers:



Those producers who complained that the prices were low were 39.7 percent. This means that the cost of production has been going high and while the prices have been constant. The cost of one brick is Kshs 2. Prices fluctuate due to seasonal demands and, 25.6 percent of the producers thought this to be a big problem. Some producers felt they lacked a market for the bricks and these were 14.1 percent. Those who complained of competition from other building materials were 10.3 percent. For those who felt transport was a problem in marketing their bricks were

6.4 percent of the producers. Some producers felt they had a small market because they could not easily transport the bricks to distant outlets as the roads were rough and could cause breakages on the way.

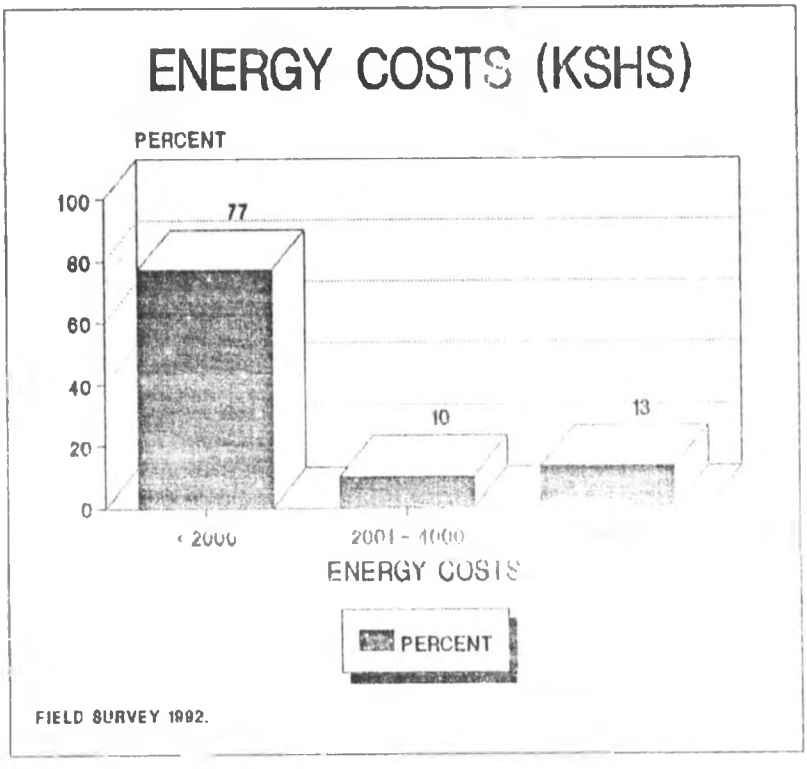
5.2.8 Energy problems:

Energy use in brick making is dominated by the kilning process. Since raw bricks are dried in the sun, this makes the firing process almost entirely the sole user of direct fuel. Large energy demands for firing are also indicated by the temperature at which kilns are operated which is usually high, sometimes in excess of 1000 degrees centigrade.

All the firing process in the study area only used wood fuel and no other source. In such a process then enough trees are required for firing the bricks, about 94.3 percent of the respondents bought the trees for firing while only 5.7 percent of the respondents had their own source.

The most serious problem raised about energy consumption was that it was expensive where about 46.5 percent of the respondents experienced this problem. The chart below shows the cost of woodfuel.

Chart 5.4 Energy costs:



This shows that most of the small-scale producers were using less than Kshs 2,000 on energy as the accounted for about 77.3 percent and for those who spent over Kshs 2,000 were only 22.7 percent. It is not easy to determine if it was expensive or not unless the cost of production is taken into account.

PLATE 5.1 Brick transportation, note the use of children in transporting the bricks.

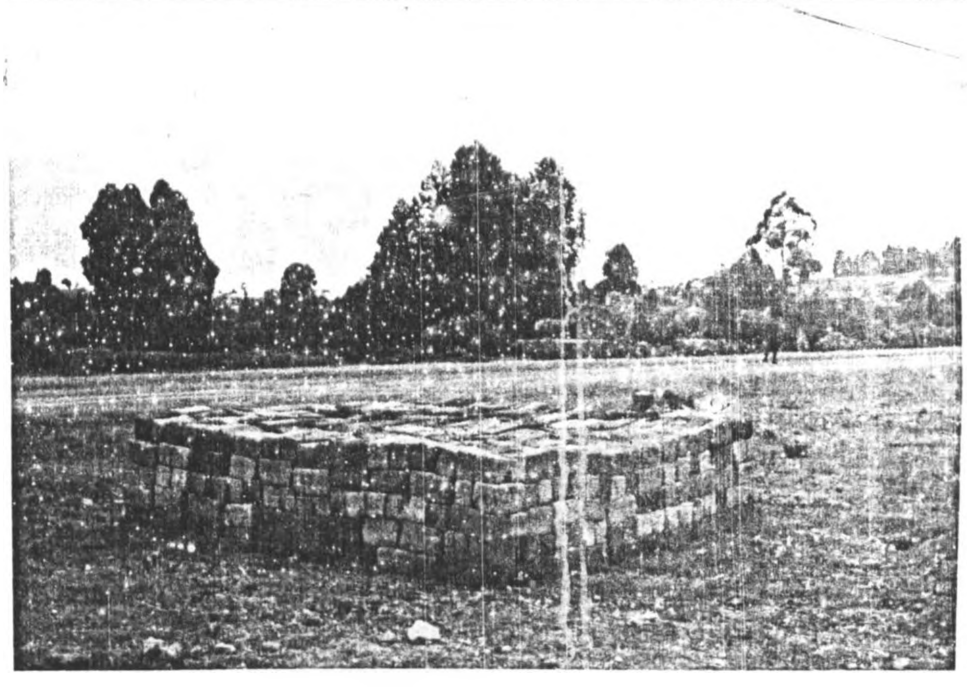


PLATE 5.2 Bricks ready for sale on the road side. Note the kilns next to the road.

CHAPTER SIX

6.0 FINDINGS, RECOMMENDATIONS AND CONCLUSION:

This chapter attempts to show the major findings from the study, it also tries to make recommendations based on the findings which were identified during the field survey. Some of the recommendations will specifically address the study area while others will be made generally. The findings are divided into two parts the first one being the characteristics and the second part being the finding on the roles of small scale building material produ

6.1 Findings:

6.1.1 Characteristics:

(i) The study established that basically the small-scale brick producers are based in the rural areas utilising local resources. They are found in the rural areas where clay soil is abundant and production is stimulated by the local market demands. All the production processes use locally available resources and thus becomes appropriate in the areas where they are located with the resources available.

(ii) It was also noted that the small-scale producers lack standardisation and quality control of the type of bricks they produce. The production of bricks sometimes is done by trial and error methods to establish if the type of soil to be used can be suited

to brick making. This was seen from the high rate of breakages of some of the bricks that were produced by some of the producers. Some producers are not able to continue with production because they are not able to determine the type of soil required to use.

(iii) Lack of technical knowledge, managerial skills and production records is a common characteristic among the small-scale brick producers. Since the producer is the manager he is the one to keep the records and has to have enough technical skills, then it makes the owner the only one to be relied upon. About 90 percent of the production units were operated by one individuals. This sometimes reduces their [illegible] in managing the small-scale production units. The technical information flow was limited and it was 10 percent of the producers who had received some information on brick production.

6.1.2 Constraints:

There are various constraints that the small-scale producer of bricks faces and unless they are tackled early enough it might be difficult for them to expand their production. The constraints range from lack of information, technical, managerial to inadequate credit facilities.

(iv) The study found out that most small-scale producers generally lack technical information

regarding production techniques and market potentials of their bricks. Some of the production methods have remained the same for a long time whereas they could easily be innovated by use of other techniques that are being used elsewhere. The lack of adequate information to the producers has led to slow change in the production processes. This is because 90 percent of the producers had not received any information on building material production. Due to this, the traditional method of brick making is being used however cumbersome it is.

(v) The extension of credit facilities to small-scale producers does not exist at all despite the very important role they play in the provision of building materials in rural areas. They rely on very limited personal savings to produce a few bricks. The problem here is that the credit facilities are only given to the small-scale commercial enterprises.

(vi) The other critical problem facing the small-scale producer of bricks is transport. The transportation of building materials must be considered first before production has to take place.

The mode of transport whether it is by animal traction, human labour or motor vehicle, the type of roads and the physical background of the area where production takes place has to be considered. The

biggest problem in transporting bricks is the high rate of breakages due to poor handling and rough roads. From the study 32 percent of the producers complained of the problem of breakages of the bricks. The frequent rains are also a problem because most of the roads are impassable during the rainy season and the producers stop production during this season. The producers who complained about the poor state of the roads constitute 11 percent of the producers.

The topography especially the hilly areas are not easily accessible. This is because the bricks have to be transported from the river line plains to the roadside mostly on the hills.. Those who complained about the topography were 12 percent of the sampled producers. It is not easy to transport the bricks since they are quite bulky and needs careful handling.

(vii) The roles played by the small-scale brick producers are very useful for the housing development in the rural areas. They provide bricks for housing at a fairly cheap price unlike the other building materials such as concrete and quarry stones. The cost of one brick is between Kshs 2 to Kshs 3.00 whereas the other materials such as concrete blocks and stones cost twice or thrice as much. The bricks were found to be on high demand unlike other walling materials which were expensive. This is because other materials such as blocks and stones cost between Kshs 4 to Kshs 5,

this makes the bricks cheaper to use.

Production of bricks has also helped to increase incomes to the brick producers. The producers who are involved commercial in brick production were 88 percent of the sample. This means that only 12 percent of the producers were engaged in production for own use. It was also found out that 48 percent of the producers receive between Kshs 15,000 to Kshs 20,000 income per year from the sale of bricks. The highest income received per a year was Kshs 90,000 from the sale of about 36,000 bricks. This shows that as production expands incomes also increase. Apart from the incomes received from agriculture, production of bricks is also acting as another source of income to the producers.

The development of skills in brick production was noted as there is an improvement in the quality of bricks produced from time to time. Mistakes are being corrected, with lessons from preceding productions. There is also an expansion in brick production, which means that the skills are spreading in most parts of the division. At the time of the survey 33.3 percent of the producers produce between 5000 to 10000 bricks, which is a higher proportion as compared to 17 percent of the producers during the past 10 years of production.

Labour intensive techniques of production and increase in such employment from the total labour force of 87 people to 112 people shows a major role for the producers. The labour force comes from the local areas of production within a distant of 1 km to 2 kms. This then shows that the small scale producers were still expanding and may lead to national development.

The improvement in the quality of housing is noted with the use of bricks in housing. The brick house owners have their houses in good conditions unlike non-brick house owners especially those ones with earth walls. The condition of the floors, roofs and walls conditions are good. Their houses have big compounds, many rooms and permanent toilets nearby made of bricks.

6.2 Recommendations:

It may be noted that small scale brick producers play a significant role in shelter development in the local areas where they are located. The most important step to be taken is to encourage the growth and expansion of their roles. The recommendations made will be of great importance to the small scale building material producer who faces various constraints in his production process.

6.2.1 Government policies on housing:

To increase the contribution of the small scale brick producers, the Government's housing policies should put more emphasis on the improvement of the small scale building material producers. There should be more encouragement on their growth through technical information dissemination about brick production. The Government should take steps to encourage the small scale industrial sector as a whole. The problem at the moment is that most of these policies developed in the [illegible] specifically structured to suit shelter construction needs.

In fact as noted earlier most Government policies towards the small scale sector have favoured small scale commercial enterprises and also food processing industries. This is the time to lay more emphasis on the housing sector. The policies should be those that are meant to develop small scale building material producers in the rural areas.

6.2.2 Information on geological deposits:

The small scale producers need detailed geological information to enable them select the right type of soils for brick making. Geological surveys of raw material deposits have often been the responsibility of the national Government in view of the high capital outlays involved. Such surveys have

either been limited to large deposits or to the so called "strategic minerals" which are of no interest to small scale building material producers in shelter development.

The effect is that several small deposits of raw materials which could be exploited by small scale building material producers for shelter construction are not surveyed. The Government should, therefore direct some of it's efforts towards geological surveys to small deposits of clay, limestone etc which are of interest to small scale building material producers.

6.2.3 Access to raw material deposits:

Lack of access to raw material deposits can constitute enough disincentive to potential small scale producers as well. This is because enough research has not been done into the use of the local resource for building material production. There should be accessibility to such resource so as to be able to exploit the few available resources. The Government can do this by:

(i) Undertaking tests on the suitability of raw materials at particular locations and making the results known.

(ii) Compiling and disseminating information on small raw material deposits to interested small scale building material producers.

(iii) Providing access roads to raw material deposits.

6.2.4 Institutional support:

The small scale brick producers need some institutional support from the Government in the form of training, management, financial and technical support services. However, due to the unique requirements of the brick producers they have benefitted little from the existing facilities.

Institutional support can be through:

(i) Strengthening the capabilities of the existing institutions through increasing the number of the professional staff and equipment position to meet the specific requirements of brick producers operating in the building material sector. Activities of these institutions can be decentralised to cover wider geographic areas. These institutions include, Housing and Building Research Institute (HABRI) of the University of Nairobi, Lake Basin Development Authority (LBDA), Non-Governmental Organisations (NGOs) such as Habitat, Action aid, African Housing Fund, Appro-tec and Intermediate Technology Development Group (ITDG). This institutions can provide both technical and managerial assistance to the small scale production units.

(ii) Providing common logistic support to groups of small scale brick producers especially in areas where

they have no previous training.

6.2.5 Improving technologies:

Although brick producers utilize very simple technologies, these may not be the most appropriate in all establishments. Material wastage and low quality products are noted as some of the major problems facing the small scale brick producers. Some of these problems may have bearings on the production technology. The technologies can be upgraded by:

(i) Establishing appropriate technology information centres where data on selected technologies are received, and disseminated to target establishments this can be done by the Government especially through the Ministry of Lands and Housing.

(ii) Providing training in appropriate technologies to producers through extension services.

6.2.6 Establishing credit facilities:

From the field it was noted that the brick producers face some financial bottlenecks. Although the Government has established credit institutions for small scale enterprises, it tends to favour the small scale commercial enterprises .This tends to neglect the specific needs of the small scale production units of building materials. The intervention may be through the following methods:

(i) Promoting the mobilisation of savings among small scale brick producers.

(ii) Promoting the establishment of suitable savings institutions specifically for small scale building material producers.

(iii) Providing training in basic financial management for proprietors of small scale brick producers.

6.2.7 Standards and quality control:

Another area where Government assistance will be very valuable to small scale brick producers is quality control. It has been noted that some bricks from small scale establishments are of low or [illegible] quality. In almost all cases, there is no quality and standard regulatory procedures for the small scale brick producers. This has often led to the production of bricks which are not very durable and sometimes unsafe for shelter construction. There is need to disseminate information on regulatory procedures to brick producers. The Government can do this by:

(i) Designating a national agency to coordinate the formulation of standards and promotion of quality control procedures especially the Housing and Building Research Institute of the University of Nairobi. This can be a good beginning as an agency involved in appropriate building material promotion in the country

with an emphasis on local building materials.

(ii) Supporting research organizations and similar institutions in preparing and disseminating information on quality control procedures to target groups.

6.2.8 Manpower training:

A final area the Government could assist to increase the contribution of small scale brick producers is in the training of requisite man power. Skills training is very relevant to the formulation of standards, management of credit, and improvement in production technology. Man power training will therefore, be very vital to improving the overall performance of the small scale brick producers.

6.2.9 Environmental improvement:

The improvement on the grounds where production takes place needs to be stepped up. This is to make these places much more useful in the future. This can be done by various methods, the common one being by refilling the holes and then plant trees to make the ground more stable.

The other method that can be used is by turning the ground openings into fish ponds. These are known to be possible in such areas because certain types of fish can survive and there is sufficient supply of

water.

The environmental pollution during the burning of bricks and the use of woodfuel is not a serious problem at the moment. The continuous and future expansion of production will increase the problem of woodfuel and it's related environmental effects on these localities. There are limited alternative sources of energy that can be used at the moment other than woodfuel. However, more should be done to look into other sources of energy. The encouragement at the moment should be to use energy saving production techniques. Planting of more trees should also be encouraged to meet the energy requirements for present and future brick production.

6.3 Conclusion:

The role of the small scale brick producer has been noted to be quite significant in the building material production in the rural areas. This is an areas that needs to be looked into for the future production of building materials.

The provision of materials for housing has been left out for some time in the National Development Plans, and the role played by the small scale producers have been given very little attention. It is now high time that they should be given considerable thought and be incorporated in any National Housing

Policy.

Small scale brick producers have a unique role to play in national development particularly regarding the provision of basic shelter. Their effectiveness in utilising small and dispersed raw material deposits, minimal capital requirements, labour intensive technologies and potential for employment generation are very valuable for shelter construction and sub-regional development.

The large scale building material manufacturing industries are normally located in a few urban centres. Due to inadequate transport, most of the rural localities have infrequent supply of materials for building construction. Even when the materials are available, their prices are beyond the means of low income people. It is due to some of these that small scale producers to shelter construction should be encouraged to grow.

However, small scale production units especially in Kenya do not obtain sufficient support from the Government. Although the Government has good policies for the development of the small scale sector, the specific requirements of the building materials sector have not been adequately met. As a result technical, managerial, and financial support services are still inadequate for the small scale brick producers. This is why most small scale production units are unable to

expand their activities faster.

Unlike in other countries such as Japan, Korea, Singapore and India which have benefitted largely from the international community in developing their small scale building materials production, African countries and Kenya in particular have benefitted less, (Afele 1986). The effect is that small scale producers are unable to gain from technology, skills, research and investment capital resources that come from the international community.

Even in the presence of difficulties, the small scale building material producers have proved valuable to shelter construction. They have been effective in reducing prices of some materials, import substitution, resource utilisation all of which contribute to development and shelter construction. It is therefore, necessary for the Government to implement measures that would enable small scale brick producers to increase their contribution to shelter construction and development through increased productivity, expansion of existing facilities and attraction of new producers into the sector.

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APPENDIX

SMALL SCALE BRICK PRODUCERS QUESTIONNAIRE

QUESTIONNAIRE NO_____

SOCIO-ECONOMIC BACKGROUND:

1. Sex of the respondent
   (1) Male
   (2) Female
2. Age of the respondent_____
3. Marital status
   (1) Single
   (2) Married
   (3) Divorced
   (4) Others_____
4. Level of education_____
5. Occupation
   (1) Farmer (2) Teacher
   (3) Civil servant (4) Businessman
   (5) Professional (5) Others_____
6. Level of income per month Kshs_____

PRODUCTION PROCESS:

7. Which year did you start the production of bricks_____
8. What made you start the production of bricks?
   (1) Source of income (5) Influence by others
   (2) Own use (6) Use of poor land
   (3) Employment (7)Others_____
   (4) Cheap
9. Where did you get the finance for your investment?
   (1) Personal savings (4) Assistance from relatives
   (2) Bank loan (5) NGO
   (3) Co-operative loan (6) Self help
10. Initial capital of the project_____
11. How do you determine the best soil for making bricks?

(1)_____
(2)_____
(3)_____
(4)_____

12. How do you determine the quality of the bricks produced?

(1) Colour
(2) Hardness
(3) Weight
(4) Knocking(Ncise)
(5) Others_____

13. Where do you store your bricks?

(1) Open air
(2) Permanent
(3) Temporal house
(4) Under shade

14. What is the size of land under brick production sq meters_____

15. Do you intend to continue producing bricks?

(1) Yes
(2) No

16. If yes for how long?_____

17. If no why

(1)_____
(2)_____
(3)_____

18. How do you improve the ground for future use?

(1)_____
(2)_____
(3)_____
(4)_____

19. How many bricks did you produce first year_____

20. How many bricks do you produce per year?_____

21. How much do you earn from bricks per year? , Kshs_____

22. Why did you chose on this type of technology?

(1) Cheap
(2) Locally available
(3) Trained for
(4) Labour intensive
(5) Easy to maintain

23. Factors hindering the technology

(1) Expensive
(2) Inappropriate
(3) Lack of training
(4) No problem
(5) Others

24. Suggest technological improvements

(1)_____
(2)_____
(3)_____

25. Where do you get any information on the improvement of brick production?
(1) Lake basin dev't authority
(2) Government (4) NGO
(3) HRDU (5) None

LABOUR FORCE:

26. Number of people employed initially_____
27. Number of people presently employed_____
28. What is the main labour force?
(1) Men (3) Children
(2) Women
29. On what basis is the labour force employed?
(1) Permanent (3) Casual
(2) Part time
30. What is the expense of the labour-force per 100 bricks_____

ENERGY:

31. What is the source of energy?
(1) Wood fuel
(2) Charcoal
(3) Others_
32. Do you have your own source of energy?
(1) Yes
(2) No
33. If no what is the source
(1) Get free
(2) Buy
34. If you buy how much does it cost you annually? Kshs_____
35. Do you have any energy problems?
(1) Yes
(2) No
36. If yes what are the problems
(1) It is inadequate (5) Not appropriate
(2) Resource depletion (6) Pollution
(3) Expensive (7) Others_____
(4) Transportation
37. How do you intend to solve the above problems?
(1)_____
(2)_____
(3)_____
(4)_____

MARKETING

38. For who do you produce most of your bricks?
(1) Own use
(2) For sale
(3) Others

39. Who are the major consumers of your bricks in the market?

(1) Private individuals
(2) Institutions
(3) Middlemen
(4) Others_____

40. What marketing problems do you face?

(1) Lack of market
(2) Low prices
(3) Varying prices
(4) Transport
(5) Competition
(6) No problem
(7) Others

41. Perceived solutions in marketing

(1)_____
(2)_____
(3)_____
(4)_____

TRANSPORT:

42. How do you transport your bricks from production site?

(1) Motor vehicles
(2) Human
(3) Animal

43. Do you face any transportation problems?

(1) Yes
(2) No

44. If yes which ones

(1)Expensive
(2)Lack of vehicles
(3)Poor roads
(4)Topography
(5) Rainfall
(6) Breaking bricks
(7) No problem
(8) Others_____

45. How much do you spend on transport per year?_____

46. Where do you invest the money you get from the sale of bricks?

(1)_____
(2)_____
(3)_____
(4)_____