

Dissemination of Low-cost Building Materials and Technology in Kenya

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Problem Definition

The rapid pace of urbanisation in Kenya has greatly increased the demand for shelter. Due to lack of resources, population growth (induced by rural urban migration and natural increase) cannot be matched with the provision of basic services. The bulk of the population therefore has to provide housing for themselves resulting in shanties in the urban areas and substandard housing in the rural areas.

Housing intervention strategies have been introduced by the government to try and modify the problems existing in the housing market. Research on local building materials and dissemination is one form of strategy introduced to avail local building materials that are durable and affordable to the poor.

Various agencies have been active in the field of intermediate technology ranging from research and development agencies, donor agencies, finance institutions, non governmental organisations, community based organisations, government ministries and departments. They undertake independent programmes and projects and hardly collaborate with each other in their implementation strategies. There is also no central agency overseeing and co-ordinating the various activities of these agencies as a result of which there are duplication of efforts and adhoc approaches.

These agencies have been in existence since the early 1980s but the impact of their activities has been minimal since most of the Kenyan poor still live in sub standard housing in both the rural and urban areas and the improvement in housing using low cost building materials has not been much.

This paper addresses the issue of availing local building materials to the poor in both the rural and urban areas. It is the poor who cannot afford to house themselves without some form of assistance as compared to the high income who have access to financial resources to construct their own houses. The high income group also have a tendency to consider conventional and imported building materials as superior to the local ones yet problems are caused than solved when materials and construction techniques from external sources are imposed on a society with different cultural, social and economic background.

Motivation for the Choice of Study

“The Use of traditional building materials especially in the rural areas should be encouraged and so should research on cheap and sustainable materials”¹. This was a national follow up action proposed in 1990 towards achieving sustainable shelter development by the year 2000.

The department of housing is the government arm that handles issues relating to housing for the nation. I have worked in this department since 1993 and looking back at this proposal, our achievements in the field of building materials have been minimal.

I am responsible for the promotion and dissemination of low cost building materials and in my eight years experience; the impact of our dissemination strategies has not been great. Many people are still living in substandard housing in both the rural and urban areas. Others have not even heard of the cheaper materials

¹ Unchs, Habitat.1991. *Global strategy for Shelter to the year 2000*.

yet the availability of cheap building materials in Kenya would greatly reverse this situation.

Objective

This paper analyses the projects and strategies of the various agencies involved in low cost building materials with the aim of formulating a strategy for implementation from their successes and failures.

Background

Building materials are a critical building resource and account to over two-third of the total building cost. They largely dictate whether dwelling units can be realised. However, conventional building materials are expensive and are sometimes not available and have to be imported. They are also capital intensive and out of reach for the majority of the Kenyan people who are unable to live in decent and affordable houses whether publicly or privately built under the current conventional mode of building materials productions and house delivery systems.

Below is a brief discussion on the available conventional building materials.

Cement

Cement is currently produced in three major factories for both the local and export market.

Domestic prices have steadily increased over time. The price of a 50 kilograms bag in 1980 retailed at approximately 40 shillings .It more than doubled in 1987 and was retailed at 84 shillings and at 120 shillings in 1990.² The current price is approximately 450 shillings (about 6 US\$).

The high cost of cement coupled with occasional shortages, high transport costs and its unavailability in some remote parts of the country has adversely affected the cost of many cement based building materials like concrete blocks, mass and reinforced concrete, slabs etc.

Concrete Blocks

These are either factory or manually produced. They depend on cement and are therefore expensive. They are however the most commonly used walling material for residential properties within Nairobi.

A study carried out in 1983 revealed that they were the most expensive input in construction contributing about 26% of the overall materials cost³.

Common sizes are 90, 140 and 190 mm and their respective prices are 500 shillings (6.7 US\$), 650 shillings (8.7 US\$) and 800 shillings (10.7 US\$) per metre sq when built.

Natural Stone

This is a cheaper walling material as compared to concrete blocks. It is also commonly used especially in the outskirts of the city or main towns. Sizes are similar to those of concrete blocks and the corresponding costs per Meter Sq are 400 shillings (5.3 US\$), 500 shillings (6.7 US\$) and 600 shillings (8 US\$)

Roofing Materials

The most commonly used roofing materials are tiles and galvanised corrugated iron sheets. Tiles are either clay or concrete and the costing per metre square is approximately 435 shillings (6 US\$) and 550 shillings (8.7 US\$) respectively. The most commonly used gauge for Gci sheets is 26 and the costing is about 400 shillings (5.4 US\$)

The materials discussed above are expensive and out of reach for the poor. They also have high import content in production and purchase. This scenario calls for the development of a local building materials industry that will depend on available local resources. The development and utilisation of local building materials whose production techniques are labour intensive has many advantages including:

² Ministry of planning, 1980. *Economic Survey*.

³ Agevi, 1987. *Building and Construction Industry. A Case for Actors and Building Materials*.

- Creation of employment
- Provision of own job training opportunities for unskilled labourers
- Offering opportunities for the establishment of small scale production units
- Conservation of scarce foreign exchange resources
- Tapping of un-exploited or under utilised local building materials resource
- Introduction of technologies that preserve local building tradition and do not conflict with the prevailing social, cultural and the built environment.

It is for this reason that the government and other agencies have been involved in research of building materials and dissemination of the technology as a way of making housing cheaper and affordable to a larger proportion of the population

Research on Local Building Materials

Stabilised Soil Blocks

Burnt bricks were introduced in Kenya by the missionaries as a modification of the traditional mud and wattle walling material. Brick making is well established in the western and eastern parts of the country.

Currently, bricks are not widely used because of their failure to meet the unreasonably high building materials standards and their inconsistency in quality and appearance.

A major drawback in the production of this material is the need to burn. Wood is commonly used and this has an effect on deforestation.

Due to these drawbacks, the housing and building research institute of the university of Nairobi realised the need to introduce a material that is durable, affordable and can be produced locally and manually. They carried out research on soil blocks in conjunction with the German and Kenyan governments. The blocks were stabilised with cement to make them stronger.

Fibre Concrete Roofing Tiles

The institute also carried out research on concrete roofing tiles. Initially, sisal fibres were used in production but were found to rot with time. They have so far been replaced with quarry dust.

These materials have so far been tested by the Kenya building standards and found to be favourable for use in the country. They also reduce the cost of construction by as much as 30%⁴ as compared to the other conventional building materials.

Several agencies, including the government have been involved in disseminating these research findings. They however operate independently and hardly collaborate with each other.

Projects by Different Agencies

Several agencies have been involved in low cost building materials ranging from research development agencies, Donor agencies, financial institutions, Non governmental agencies and community based organisations. This section discusses the strategies of selected institutions and organisations and analyses the actors together with the results of their activities.

Housing and Building Research Institute (HABRI)

The institute is under the university of Nairobi and its research efforts were concentrated on walling and roofing materials. On walling, research was carried out on Stabilised Soil Blocks and the reason for this was that Soil was and, is readily available, it is cheap, has good thermal properties and the technology is easy to learn. Due to its weakness when in contact with water the blocks were stabilised through physical compaction, using the block press. Cement as a binder was also introduced.

Fibre concrete roofing tiles were also introduced as an alternative to the conventional roofing tiles and galvanised iron sheets.

Field trials were carried out in Kawangware (an unplanned low income area in Nairobi) and a 50 sq.m health clinic was constructed using this technology, at less than 50 % of the prevailing conventional cost.

⁴ Agevi, 1987. *Building and Construction Industry. A case for Actors and Building Materials.*

The unit mounted training in the whole production process on ways of soil selection, sieving the soil, mixing and simple soil tests. The people offered free labour while the institute trained and offered training materials and techniques. Masonry and carpentry techniques were also imparted in the local community to the youth and artisans involved. To the women, a business was introduced and they continued producing roofing tiles both for use and sale. The women have continued producing materials but currently at low production rates.

Other demonstration units put up by Habri included teacher's houses in Nyanza province, which were funded by USAID. The entry point for Habri to the community was through the teachers Co-operative which was not popular at the time and many people in the community remained on the defence and only became interested when the project was about to end.

Personal Analysis of the Actors and Results of the Project

The building research institute was responsible for training the communities in production of the materials and construction using the same. It also offered training materials including equipments

Although a demonstration unit was put up in the area as a guide to the community and as a way of encouraging them to use these materials, the result is yet to be seen, as there is hardly anyone who has used these materials in construction.

The community was the beneficiary of the project and the people acquired production and construction techniques. They offered free labour but the whole community was not committed to the project as depicted by the high levels of labour irregularity yet the project was labour intensive. Training therefore was not consistent and it was difficult to maintain quality control since people were not regular.

The question of self-help is questionable. The people have to be devoted to the project. There was acute hunger in the country at this time and people could not work for free. Labour had to be hired and due to this occurrence of non-expected expenses the number of units were reduced

There is need for a universal mechanism for transferring the technology to the community and it is important that a reputable institution or community-based organisation is chosen. In the project where USAID funded the construction of teacher's houses people could not accept the project because they did not like the co-operative. It is important for donors to be involved in the implementation and monitoring of projects which should also be evaluated after completion to determine if they are successful or not

Government of Kenya in Collaboration with German Technical Co-operation (GTZ)

This was a bilateral project between the Federal Republic of Germany and the government of Kenya with the Housing and Building Research Institute as the implementing agency and GTZ as the counterpart.

The project was formulated in 1983 but effective implementation started in 1985. The materials promoted were the same as for the first project but pozzolana was introduced as an alternative binder to cement.

Youth polytechniques were used as the main entry to the community. This was because every region had at least one youth polytechnique. Secondly, the youth were the future artisans and there was need to incorporate the technology in the syllabus.

The first national training programme was organised at Karen Youth Polytechnique in Nairobi for four weeks. A house measuring 76 metre sq was also constructed during the training programme.

Further trainings were carried out in Mazeras (coast), Kangema (central), Mogotio (Rift valley) and Maseno (Nyanza). A demonstration unit was put up on each site.

Under this project, water harvesting from the roofs, as an infrastructure was incorporated. Amref and Kwaho (Kenya Water And Health Organisation) were incorporated in the team to advice on health implications.

In each polytechnique, instructors were trained who in turn trained the community when need arose.

Regional seminars were organised for the instructors to air their views and exchange experiences on the problems they faced in dissemination.

The project was completed in 1994 and was officially handed over to the government of Kenya at Lucky Summer, Nairobi, where a group of women constructed a double storeyed unit of four flats, two bed roomed each, using stabilised soil blocks.

Personal Analysis of the Actors and Results of the Project

The main actors in this project were the youth polytechnics where the future artisans were trained. They were equipped with the knowledge with the hope of passing it on to their communities.

The project succeeded in creating awareness of the existing technologies. As a result; there were numerous requests for training. The Eldoret municipal council for example requested for assistance in construction. Classrooms and teachers houses were put up at Kimarel Primary School, within Kimarel Site and service scheme, a low-income area. This project created precedence as far as relaxed building standards were concerned in that local authorities to incorporate these materials in their projects

However, it would have been more effective if the institute had selected community-based organisations as the medium of dissemination since the community is usually the recipient and the one in need of improving their housing situation. The artisans are in business and will be involved in projects where they would benefit financially

Several agencies were involved in the school project and occasionally institutional problems were experienced because of the actors overlapping and conflicting roles.

Action Aid

This is an international non-governmental organisation with a branch in Kenya. Its main interest is in assisting rural and marginalized communities through education. They have assisted local communities to improve school buildings as long as appropriate building materials are used. The materials they have promoted are sun dried bricks, burnt bricks, stabilised soil blocks and fibre concrete roofing tiles.

They have designated regional centres of operation and have assisted several youths to form production units for production of appropriate building materials initially used in constructing schools in the area.

These production units consist of youths who are trained, equipped with tools and given a soft loan. They produce materials under the supervision of Action Aid and are assured of a ready market since Action Aid buys the materials for the construction of schools. Action Aid has facilitated the construction of over 100 schools in the country.

The production unit is expected to register with the Ministry of Culture and Social Services. These units are found in Kiboswa (Nyanza), Webuye (Western), Ikonga (Eastern) and Korogocho (Nairobi).

The NGO is also accredited for the Action Pack, which is a modification of the block press to suit local conditions.

Personal Analysis of the Actors and Results of the Project

Some of the groups formed do not always have the business urge and cannot therefore penetrate the business market. There is need to teach business skills as the groups are taught on how to produce materials.

Building materials are sometimes subjected to unnecessary scrutiny by local authorities and public institutions. The NGO put up a school in the North Eastern Province and the ministry of public works declined to take over the school on grounds that it did not meet the standards. To avoid such scenarios it is important that high standards are achieved both in the materials and construction.

African Housing Fund

The NGO was established in Kenya in 1988. Its operations have so far been suspended since it went under receivership in the year 2000. However, its strategies have been considered because it was a significant player in the Kenyan scene of promoting small-scale producers and builders and a lot can be learnt from them.

The organisation had a unique experiment with popular participation of committed and hard working African women. The other innovative aspect was in

assisting the poor directly without going through government agencies but managing useful and effective collaboration with these agencies at all levels. They assisted the local self-help groups in training, funding and lobbying support for them.

One of the best examples of the organisations support was the assistance given to Umama Womens group from the Mathare valley. The first phase of the project consisted of training the members in various skills and setting up a business for building materials production. The women secured a 5.2 million (69.334 US \$) contract with the support of the organisation to supply roofing tiles for the Komarock housing project where 2,000 residential units were being put up for the middle income.

About 140 members were trained and employed on the project mainly on tile production. They produced on two-shift basis with daily production of about 4,900 tiles. About 15 women were trained on laying the tiles. They acquired useful carpentry skills that greatly assisted the group in constructing their own self help houses in Dandora.

The project was successful and the reason attributed to this was the comprehensive approach of the organisation. A comprehensive welfare programme was incorporated in the building materials programme and the members were trained in project management, business management and social organisation and It was interesting to note that whenever there was a reduction in production, the problem was traced to a social problem among the women. The members decided who attended which training programme

Different specialised training agencies and individuals were used to cover different training components. Some members of the group who had hardly had 4 years of formal education are now computer literate.

This project has demonstrated that even a marginalized group from one of the largest slums in Kenya could be trained to produce innovative building materials at small scale with indeed factory discipline.

Personal Analysis of the Actors and Results of the Project

The Umama building materials enterprise is by and large a success story. The benefit of teaching other skills related to the production of building materials is evident. The women succeeded because they not only knew how to produce tiles but they also knew how to manage their business.

They were also devoted to their project. They had organised schedules and produced the tiles in turns. The reason for this could have been the fact that they had a ready market for their tiles and they had to produce to get the money.

The donor (African Housing Fund) very active in this project and got involved project from inception to completion and through it, several external organisations got involved in this project. This may be a clear indication that preferential treatment is received in projects where other international and donor agencies are involved but all the same these agencies got involved because AHF wanted the best for the women.

There is need to make use of local equipment, tools and components. In this case the vibrators and moulds were imported. The effect of imports is that they reduce the profits of the group and deny the local equipment an opportunity to be tested as far as performance is concerned.

The project indicates that community participation, collaboration with other actors, management skills and a ready market will determine if a project succeeds or not.

It is unfortunate that AHF has gone under receivership but as far as this project was concerned their role was very significant and a lot has been learnt from them.

Department of Housing, Ministry of Roads & Public Works

The department of Housing is the government arm charged with the responsibility of formulating and implementing the housing policy.

The promotion of local building materials is a major responsibility of the department and it has been active in dissemination of low cost building materials and technology as a means of making housing construction cheaper and affordable to the majority of Kenyans.

The government has promoted and encouraged research in building materials as a way of tackling the housing problems facing the majority of the population. It, through the department in collaboration with the German government funded the

Housing and Building Research Institute of the University Of Nairobi to carry out research on stabilised soil blocks and fibre concrete roofing tiles.

Trainers from the department (both from provincial and headquarters level) have been trained at the institute on production and construction techniques using these materials so that they would in turn disseminate the same to the communities.

The creation of awareness is an integral part of dissemination. This is usually through exhibitions; annual agricultural shows where the department has constructed stands in the provinces using these materials; and public meetings held at the provinces.

The result has been that many people have continuously approached the housing department for assistance in training on the production of these materials, equipments required in production and design of buildings.

Several community groups have been trained and it is the policy of the department to train groups of people rather than individuals because in so doing more people are trained and the technology is disseminated far and wide.

In most cases all expenses are met by the government, ranging from the materials required for the training like cement and sand and stationery etc. This has proved to be expensive especially at this time when public finances are limited and budget allocations have been reduced by more than half.

It is also worth noting that the housing policy for Kenya has now changed from the government being the provider of shelter to it's citizens to that of a facilitator or enabler for other actors to participate in the provision of shelter.

Personal Analysis of the Actors and Results of the Project

The main actors in this project are mainly the communities requesting for assistance and the department whether at provincial and headquarters level.

Usually the government meets all the expenses related to the training and then lends the production equipment to the group, at no cost, for a certain duration of time. In most cases the groups do not produce as expected and few have build or improved their houses using this technology. Sometimes they do not adhere to instructions hence the need for close supervision .In other cases the machines are not made use of. It is important that the people also contribute to the costs incurred because this will ensure they are committed. The machines should also be lent at a fee and for a specified amount of time to make them more active.

Proposals for a New Strategy

From the above discussion it is evident that glaring gaps are still evident in the promotion of local building materials in Kenya despite the activities of the several agencies discussed above. Although their impact has been minimal, these agencies have laid down models for future development works. Useful lessons have been learnt and new challenges encountered through the analysis of these projects.

The proposed strategies aim at strengthening the national policy environment and institutional arrangement, improving the capacity of the housing department to carry out building materials programmes in line with the needs of the poor and strengthening the channels of co-operation between various actors to accelerate technology transfer in the local industry. A pilot project has also been proposed as a model for implementation by the department.

A monitoring and evaluation mechanism is proposed for the continuing assessment of the effectiveness of national policies and programmes in the building materials sector.

The Role of the Department

The department is responsible for the formulation of policies relating to housing and translating them into programmes of action. In relation to building materials, it has the responsibility of availing the technology of the cheaper materials, creating an enabling environment for the participation of other actors, strengthening the technological capacity of small scale producers and assisting the poor in improving or creating their own shelter.

Policy Issues

Government policy actions will generally determine the environment in which small-scale producers operate. Policy measures that stimulate small-scale production

in building materials include fiscal policy (e.g. tax exemption), industrial policies (e.g. reservation of production of certain materials only by small scale producers). Trade policies (e.g. restriction on import of capital intensive technologies as an alternative to labour intensive technologies).

Other policies are restrictive and prohibit the use of certain materials in some areas. Soil blocks for example cannot be used in certain areas of urban centres and there is need to change this policy.

Specifications for public buildings are often prepared by government departments in ways that are discriminative of innovative technologies using locally available building materials. The Housing department for example is responsible for constructing on behalf of the government and although there is little construction currently going on, we rarely construct using these materials yet we expect others to do so. We should make use of these materials when the need arises. It is however commendable to note that soil blocks have been used in the mathare 4A slum improvement programme.

These policy issues affect our operations yet they are not within our jurisdiction. We should take the lead in lobbying for changes within the respective authorities so that changes may be effected in respect to the policies.

Technology Transfer and Capacity Building

It is our responsibility to transfer technologies to the people. Since the process of technology development and transfer is generally slow, technologies that are easy to teach and produce should be adapted. Information on the technologies available in building materials should also be available. Currently, such information is usually not available.

From the analysis of the projects undertaken by the different agencies, it is evident that training the poor on production and construction using low cost building materials and leaving them to improve housing on their own is not enough. The experiences of African Housing fund illustrate that, if enabled, the poor have the ability to remove their obstacles. Since they have limited finance to improve housing on their own self-help improvement that involves the community should be encouraged.

The availability of finance is essential if the small-scale producers are to operate and if the poor are to provide and improve housing for themselves. The government can assist them by encouraging commercial banks to adapt some of the features of the informal sector like low transaction costs and extend credit to them

The government can also encourage development finance institutions to provide incentive schemes to commercial banks so that they may in turn lend to the small-scale producers.

Institutional Support and Strengthening

Institutional functions relevant to the building materials sector can be identified as technical development to suit the local environment, workforce development to upgrade the skills of the trainers, trainees and entrepreneurs and industrial extension services like providing continuous information, monitoring and evaluation.

To strengthen institutional support in the building materials industry, there is need to review the activities of the department and see if they are in line with the support functions mentioned above. Our programmes must be oriented to focus on the technological needs of the building materials sector. This calls for attitudinal change especially in prioritisation of projects as this has a direct impact on how resources are allocated between programmes.

It is necessary to confer on housing the position it deserves in the constitutional and legal framework of the country by giving the Department of Housing statutory duties and obligations.⁵ These should be spelt out clearly to avoid duplication by other government departments. The review of the national housing policy has taken long. This should speed up to arm the department with legal backing in its operations

Cost sharing with the communities concerned should be encouraged. The people should contribute in purchasing the training tools and also hire equipments from the department at a fee for maintenance purposes.

⁵ Unchs, Habitat.1991. *Global Strategy for Shelter to the year 2000*

Collaboration with other Actors

Collaboration among other actors involved in the building materials sector should also be encouraged. This will avoid duplication of duties and allow exchange of views on how best to promote the technology. The following is a list of other actors, other than the department of housing, and the roles they should play:

Proposed Actors

Private Entrepreneurs

These are people who look for opportunities where demand for building materials is identified and the product can be supplied at a cost significantly less than the expected selling price, providing a profit. The technology in this case provides an opportunity to reduce costs, improve quality or introduce new products. Entrepreneurs who have been in operation long would offer advice to prospective small-scale producers.

Appropriate Technology Development Agencies:

These are non-governmental agencies that have been engaged in technology development and transfer in relation to low cost building materials. They have been supportive and have sometimes funded projects and offered independent advice on potential producers and users.

Housing and Building Research Institute

HABRI is a department of the university of Nairobi and has been active in research of building materials. They were responsible for research on both soil blocks and fibre concrete roofing tiles. Habri has worked closely with the department especially in the initial phase of the project when the government partly funded them to undertake research and through the initial phases of dissemination.

They should explore the possibility of further research in other building materials.

National Housing Co-operative Union (NACHU)

Nachu comprises of several housing co-operatives whose members have a common goal of providing or improving shelter for themselves. The role as far as the co-operatives are concerned is to provide technical.

The union would be instrumental in identifying community organisations that would be used as the mode of dissemination.

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