ISSUES INFLUENCING THE UPTAKE OF INTERLOCKING STABILIZED SOIL BLOCKS IN MALINDI SUB COUNTY.

(Sub-Theme: Affordable housing)

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ABSTRACT

This research investigates issues influencing the uptake of Interlocking Stabilized Soil Blocks (ISSBs) technology in Malindi Sub County. The literature review revealed that several factors contributed to the low uptake of the technology. Key among the factors was the fact that people were found to be a bit conservative and as such, rigid to technological developments, especially in construction technologies where many believe the conventional methods are still the best. The study was carried out in Malindi Sub County. Convenience sampling was used where the researcher, identified three strata, namely masons, rural home owners, and urban home owners. All the respondents in each stratum were selected randomly from all the five wards of Malindi Sub County in equal measure. The study involved certified masons from all the sub counties, rural homeowners, and urban homeowners. The sample size was determined using the simple random sampling approach. To achieve the objectives of the study, 20 masons,30 rural homeowners, and 30 urban homeowners responded to the questionnaires. The questionnaire had both open and close ended questions. Analysis and discussion of the data was mainly through statements. From the findings, it was evident that the continued low use of ISSB technology in Malindi Sub County is a result of the kind of attitude that people have towards new technologies. The ministry had done enough sensitization on ISSB, and created adequate awareness thus the question of lack of information did not arise for the low uptake of the technology. Generally, people were just resistant to change and remained adamant on the continued use of conventional methods of building like the use of red bricks and coral blocks. Recommendations to improve and increase the uptake of ISSB were a need for, more sensitization workshops and more demonstration units. The government should embrace the technology in its Housing Projects. There is need for the expected recipients of the new technology to be availed with clear cost guidelines and the number of interlocking mechanized machines be increased.

KEYWORDS: *Interlocking Stabilized Soil Blocks, Housing Projects, Malindi Sub County.*

INTRODUCTION

Food, clothing, and shelter are basic needs for all and sundry. The struggle to acquire these needs according to Kakumu (2016) has progressively increased as the human population increases and cultural diversity broadens. Wadrip (2011) states that proper shelter is recognized as one of the basic needs to enhance adequate standards of living. A housing according to Kakumu (2016), has central importance to the quality of life with considerable social, cultural, economic, and personal significance. Housing despite its importance, has become a serious problem for mankind in recent times. The problem particularly concerns the delivery and affordability of housing (Mutune, 2013). In most developing countries, housing is inadequate. Kenya for example has not been able to meet the ever-rising housing demand. According to Mutune (2013), the increase in population and the high cost of permanent building materials are among the reasons behind inadequate housing in Kenya. Poor households are most affected by this as they are unable to afford permanent construction materials (Mutune, 2013).

Kakumu (2016) states that since 2007, the cost of building materials has increased by around 70% hence increasing the cost of construction. The South African government has tirelessly tried to provide housing as a constitutional right for those unable to build or buy unlike Kenya's. The cost of construction materials is not about to decrease. It continues to shoot up every day hence the need to "think outside the box". The use of interlocking stabilized blocks is one technology that can help reduce the cost of construction (Mutune, 2013). A recent study revealed that it is cheaper to build with interlocking blocks than the conventional methods (Kakumu, 2016). The ministry of housing has approximated the cost of walling to fall by 50% should interlocking stabilized soil blocks be used. Traditional methods like the use of red bricks according to Mutune (2013) contribute to deforestation hence a need for sustainable building technologies.

The use of low-cost building technologies will speed up the provision of adequate affordable housing and also preserve the environment. Sustainable technologies are those that help to protect the environment, contribute to economic development, and make use of local resources (Mutune, 2013). Interlocking Stabilized Soil Blocks is one such technology. This research study focuses on the use of Interlocking stabilized soil blocks in Malindi Sub County.

Malindi Sub County located in Kilifi County in the Coastal region of Kenya has a population of 119,859 as of the 2019 census. 80% of the inhabitants of Malindi Sub County live in substandard houses (KNBS, 2019). There is, therefore, a need to improve on these houses. Ministry of housing through the County government of Kilifi took the initiative to introduce the interlocking stabilized soil blocks technology in the region as an alternative method to enhance affordable housing.

Interlocking Stabilized Soil Blocks involves the use of stabilized soil in making blocks. According to Mutune (2013), stabilized soil is that which has been mixed with additives such as bitumen, lime, ash, or cement to improve volume stability, strength, permeability, and durability. Unlike conventional blocks and bricks, interlocking blocks are assembled with the use of little or no mortar hence reducing the overall cost. Interlocking stabilized soil blocks have a male and female profile that works as lock and key on four sides of the block (Harelimana, 2017). Hines (1992) describes interlocking block technology as one that eliminates the use of mortar during walling. It is self-aligning and generally reduces the construction cost.

Problem

According to Mwangi (2013), adequate housing is a universal right recognized internationally. This right is valid for every person. The Universal Declaration of Human Rights of 1948 recognizes the right to adequate housing as being an essential component of the right to adequate standards of living. This right was further reaffirmed by various international instruments such as The International Covenant on Economic, Social, and Cultural Rights of 1966 and the Habitat Agenda of 1996. In a broader context, housing is understood as the shelter fabric together with the living environment.

In a nut shell, access and affordability are the main challenges for low-income citizens. The cost of building a decent home continues to be a nightmare to many due to the many costs involved as a result of using the common building technologies. This research sought to gauge whether the use of Interlocking Stabilized Soil Blocks as opposed to other conventional building technologies is sustainable and cost-saving. Since adequate housing is a universal right, those living in rural areas of Kenya need also to enjoy the Affordable Housing song that is among the top priorities of the current government. The previous Population and Housing Census estimate the number of households in Kenya to be at 8,738,097. Out of this 34% had used stones and bricks as their walling material. This indicates that a whole 66% of the houses will require improvement. While most houses use proper roofing material, 31% have used standard walling materials.

The improvement of housing for its population is a major concern for the Government. This according to Kanani (2014) has been majorly influenced by the fact that improvement in housing stock is an important social and economic investment. Moreover, well-planned housing and infrastructure of acceptable standards and affordable cost combined with other essential services accord dignity, security, and privacy to an individual, the family, and the community at large. There is therefore a dire need to promote awareness of appropriate construction technologies to

achieve adequate and affordable housing. The use of alternative technologies according to Mutune (2013) is challenging in Kenya. However, if done correctly, has the potential to lower the cost of building and construction. The Kenyan government through the Ministry of housing introduced the ISSB technology in a bit to improve the housing situation in various parts of the country. Despite the efforts, the housing situation has not improved to date in Malindi Sub County. Most of the people have continued to live in sub-standard shelters. The region has been slow o adopt this alternative building and construction technology. Most people here have a strong bias toward conventional building technologies. This bias could be influenced by various issues. This research paper will address the issues influencing the low uptake of this ISSB technology.

Research Objective

The general objective of the study was to establish the issues influencing the uptake of interlocking stabilized soil blocks as an alternative walling technology in Malindi Sub County.

The specific objectives of the study were:

i) To establish the suitability of the ISSB technology in Malindi Sub County.

ii) To establish the level of awareness on the use of ISSB technology.

iii) To determine how skilled masons are in use of ISSBs.

LITERATURE REVIEW

This section provides a review of various studies that focuses on the use of ISSBs in building and construction as an alternative walling material. Comparison and contrast are done on different authors' views on ISSBs highlighting the gaps.

The earth has been used as a building material for years (Mutune, 2013). It has been used to build everything from modest shelters to elaborate structures using various techniques. Due to economic and environmental concerns, however, a renaissance has been witnessed in recent years. Since it is readily available, low cost and eco-friendly, the soil has remained a major alternative to conventional building methods (Makiga, 2008). The first attempts at compressed earth blocks were in Europe. The research program for social housing in Columbia resulted in the first ever steel manual press to be used was in the Cinvaram (Mutune, 2013). The resultant bricks were regular in shape and size, stronger, and more water resistant. These blocks were an improvement of the hand-molded and sundried bricks commonly known as adobe. Since then, many more types of machines have been designed with lots of research on the specific soils for building. Many African countries, South Asia, South America, and India have since used brick technology. It is the many research activities in the field that gave birth to the interlocking block technique. The technology gained popularity in the 1960s in Thailand, the Philippines, and Malaysia. Mutune (2013) asserts that these countries initially used timber for walling which led to extensive deforestation. In Thailand for example, deforestation had resulted in a drop in forest cover from 70% to 55% as of 1961. It is now less than 30%. This led to the government initiating research into alternative walling materials. Numerous research has led to the development of various types of motor-driven and manual press machines.

In Kenya, the Ministry of housing established the Appropriate Building Materials and Technology (ABMT) program in 2006 to address the high costs of building through the provision of improved and affordable housing (Mutune, 2013). This program was meant to enhance housing conditions as well as promote related income-generating activities. Moreover, according to Mutune (2013), the program was to ensure the use of building technologies that are safe, cost effective, eco-friendly as well as innovative. The Ministry of housing in collaboration with the Housing and Building Research Institute (HABRI) of the University of Nairobi continues to conduct research which led to the development and dissemination of technologies such as ISSBs and Micro-Concrete Roofing (MCR). Currently, the Hydraform machine and the Manual machine for making ISSBs are in use (MoH, 2010). Makiga Engineering Services Ltd has come up to make ISSB machines (Makiga, 2013). Jeckonia (2011) in one of his articles writes that home builders in Western Kenya lead in the use of brick technology as it is cheaper with bricks being able to be made on the site. The coming of the ISSB technology has paved way for diversity. Several buildings in various schools in many other parts of the country have been built using interlocking blocks.

The Ministry of Housing through the County Government of Kilifi dispatched several hydraform machines to have the citizenry informed about the new technology. Training has been conducted in collaboration with Technical Colleges and Vocational Training Centres to have youths skilled in the use of these machines. This has witnessed several projects especially school classrooms built using the ISSBs technology. This is because the technology is cost-saving. If well used, ISSBs need no plastering on the outside of the house as the blocks produce admirable patterns especially when color blending is done on the blocks. The use of ISSBs is environmentally friendly, economical, strong, durable, and easy to use. Despite all this, the technology has not

gained the deserved popularity (Mutune, 2013). Being a new technology, people may be reluctant to apply it. A key action area according to Mutune (2013) is to capacity build the potential builders on the same. This will help in determining the correct type of soil, and correct proportions of moisture and cement.

As a guideline to potential investors and builders, Gichui (2012) did a cost comparison of a building using ISSBs and stone blocks. Assuming an average price of KEs 750 for a 50kg bag of cement and KES 350 to 400 for unskilled labor per day, the cost of constructing a 1 meter squared is as follows: The cost of cement per block is KES 7, labor to manufacture bricks KES 4 per brick, labor to make the wall is KES 1100 per day (1 fundi and 1 assistant) with a minimum of 500 bricks per day at KES 6.6 per brick. The total will be KES 17.6 per brick. 1 meter squared walling will have an average of 33 bricks. The total amount for 1 meter squared of Stabilized soil walling will be KES 580.80 per meter squared. If the soil is away from the site, it will translate to an extra cost of about KES 10 per meter squared.

A machine-cut stone delivered around Malindi costs between KES 45 to KEs 55 per block. In a meter squared a wall, there are 13 stones totaling KES 715 per meter squared. These stones require mortar for joining. Each square meter requires approximately 1 meter squared of cement mortar for KES 200 per meter squared adding the amount to KES 915 meter squared. Walling requires plastering on the interior surface and key finishing on the exterior surface hence costing a further KES 200 per meter squared. The cumulative cost comes to KES 1115 per meter squared. The dull grey plastered wall usually require coloring unlike the reddish stabilized soil blocks color (Gichui, 2012). This further pushes the cost to KES 1315 per meter squared. Masonry walling costs KES 222. 58% of the cost of using Interlocking Stabilized Soil Blocks for

walling. For maximum results, a holistic approach to construction rather than walling alone is preferable.

Literature has also revealed that users of the ISSB technology have a problem achieving the right compression strength hence poor quality blocks are made. This discourages more use. Cost guidelines are also not very clear. There are also concerns over inadequately skilled masons. Most writers agree that the strength of ISSBs is dependent on the type of soil and the amount of stabilizer added to the mix (Gichui, 2012). The level of uptake of the technology is still low due to the low level of awareness among the locals. Enough awareness should therefore be done. It is of importance to therefore survey the suitability of the soil before it can be used. In other African Countries for example Nigeria, South Africa, Rwanda, and Uganda, the technology has been adopted successfully.

METHODOLOGY

The study is descriptive and used a survey research design that involved the use of questionnaires with both closed and open-ended questions distributed among the respondents. The design was adopted as it allows for the collection of data from the target population as compared to other methods. The sample size was determined using convenience sampling. 20 masons, 30 rural home owners, and 30 urban home owners. This group held key information that could assist the researcher in realizing the objectives. The urban homeowners would help in determining the suitability of the ISSB technology in the area under study. The rural homeowners were vital in determining the level of awareness of the use of ISSBs technology while the masons were used to determine the skill level of masons in the use of ISSBs. Gender balance was ensured though there was no female mason found. All those sampled had some knowledge of building and had interacted with the new ISSBs building technology in one way or another. Information obtained will play a vital role in enhancing the use of ISSB technology and perhaps help in positively influencing the uptake of this technology.

Questionnaires were distributed and respondents were given two weeks to fill them up. To ensure all questionnaires issued were received by the respondents, a register of questionnaires sent and received was maintained.

FINDINGS AND ANALYSIS

The chapter presents the findings obtained from the study which was carried out in Malindi Sub County. The findings of the study generated enough information that can be effectively used in answering the research questions. The study was conducted in the 5 Wars of Malindi Sub County namely: Jilore, Kakuyuni, Ganda, Malindi Town, and Shella. Questionnaires were administered to 4 masons from each Ward, 6 rural homeowners from every Ward, and 6 urban homeowners from every Ward. Out of these questionnaires, those collected were from 20 masons, 30 rural homeowners, and 28 urban homeowners. This indicates an overall 97.5% return success. The male population was higher among the respondents at 100% among masons, 83.3% among rural homeowners, and 75% among urban homeowners. 30% of the masons had more than 5 years of experience using ISSBs technology.

All the 20 masons responded to the interview. All the masons were familiar with the ISSB technology. 50% had been trained by the Ministry of housing through the County Government of Kilifi. The 50% trained were able to operate the mechanized hydraform machines while the other 50% were only familiar with the manual machines commonly referred to as Makiga. That is to say, as far as skills are concerned, the county could support the technology. In terms of real hands-on experience, only 30% had carried out projects using the ISSBs technology. A major reason for this is that people were not so confident about the technology.

The researcher sought to find out whether rural homeowners were aware of the technology as lack of awareness would influence the uptake of ISSB technology. 81% of them had heard about the technology. 11% seemed not to have ever heard about the technology while 8% were not quite sure whether they knew about the technology or not. 52% of the rural homeowners came out clear that they had been sensitized on the same. This is a clear indication that the Ministry

had played an active role in ensuring that the citizenry gets to know about the technology. After all this sensitization, however, only 30% of the rural homeowners were willing to use the technology in building. A whole 70% said they would not use ISSBs as they were uncertain over the strength of the blocks though they highlighted it as being a good building technology.

To understand whether this technology was suitable for use in Malindi Sub County, urban homeowners were interviewed on the aspects of soil types, cost, and flooding among others. All the respondents agreed that there were enough masons with skills in building using ISSBs and that enough sensitization had been done. The majority of these areas have sandy soils with a blend of either clay or loam or both, soils which are very suitable for making ISSBs. The advantage of the coastal region is there is no adverse flooding in some parts like Lamu and Tana River. This is to say Kilifi is free from adverse flooding. It was however noted that enough demonstrations had not been done to familiarize the citizenry with the ISSB technology. `85% of the respondents agreed that the use of ISSB technology is cost effective hence affordable and sustainable building technology.

Hindrances to the use of ISSBs as walling technology were raised among them the inadequate number of hydraform machines to meet the demand which usually discourages people from using the technology. Block quality was also questionable, especially where there is no close supervision of those making the blocks. There were also concerns about the cost information of the ISSBs and the total walling cost. There is also no standard guide on the use of ISSBs. The lack of adequate funding by the government to service the machines and other technical support was also of concern.

CONCLUSION

From the research findings, it is evident that the continued low uptake of ISSB technology in Malindi Sub County is a result of the perception that people have towards new technologies. Most people are conservative of the old and very rigid to change. The majority of the respondents were not aware of the precise cost per unit block yet believed it was less expensive to put up a house using ISSBs technology. The number of hydraform machines in the was also minimal. The respondents were not aware of the total number of machines in the Sub County and accessing them was a challenge. However, these manual machines are all over the Sub County are could equally make quality, strong and durable blocks. It was confirmed that the County government of Kilifi had done enough sensitization and awareness on ISSBs. The researcher further noted that the Soils in Malindi Sub County were suitable for making the interlocking blocks. In a nutshell, the low uptake of the ISSB technology is just an issue of attitude. From different success stories, the use of ISSB technology is a cost-effective alternative walling technology. Therefore, regions that are yet to embrace this technology should learn from these successful ventures.

After discussing the findings of the study, certain recommendations are put forward for future consideration. First and foremost, more sensitization workshops should be carried out. In such workshops, residents should be taken through the need to use ISSBs as sustainable building technology. Encouraging locals to use the technology would also do more good. People can also get to understand technology better if they got support from demonstration sites. Such sites should thus be set up to facilitate a real experience with ISSBs. The constituency and government at large should also embrace the technology in its projects such as schools and hospitals to win the confidence of Kenyans. Concerned parties should also provide clear cost guidelines. There is a need to increase the number of hydraform machines to promote the uptake of the technology.

As a suggestion for further studies, a thorough study should be carried out on the cost implications of using the ISSB technology in walling, putting all factors such as excavation of sand. More studies should be done on why people tend to prefer conventional methods of building and remain rigid to new appropriate technologies.

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