THE STABILISED AND COMPRESSED EARTH BRICKS - AN INNOVATIVE OPTION TOWARDS SUSTAINABLE HOME OWNERSHIP IN NIGERIA.

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Abstract

One of the major indices of measuring underdevelopment in a country is in the area of housing. Many countries have found it difficult to establish a lasting solution to the issue of housing problems in their areas. The global economic recession with its deadly consequences on the underdeveloped nations is not helping. Two major factors are responsible for this development, first is the financial strength of the people, and secondly, the poor level of awareness about cheaper and more energy conserving alternative building materials. This examines the potentials that lie in the stabilised and compressed earth bricks as compared with the conventional as well as the local adobe and mud bricks, the thermal quality, aesthetic values as well as the ease of production and transportation are factors that are jointly responsible for the relative cheapness of the material. The communities pulling their labour and other resources together to achieve a better housing environment suggested under the 'Housing Co-operative Scheme', The central goal is aimed at achieving a sustainable policy for the poorer countries of the world. This is in line with section one, subsection 26 of the United Agenda 21 which clearly advocates the enablement of the indigenous people to practice sustainable development their lands putting into consideration economic, social and historical factors. Indigenous people should participate in shaping national laws and policies on the management of resources or other development that affect them. This is the emphasis of this paper. The application of a holistic, traditional scientific knowledge the indigenous people in land, natural resources and environment is a policy to be experimented for sustainable housing delivery.

Introduction

Ever since the mid 1980s, Nigerians had been going through series of economic crises. These crises have devastating effects on the cost of building materials and this has also affected housing supply in the country vis-à-vis the escalating house rents. Two major factors are responsible for this development, first is the financial strength of the people, and secondly, is the poor level of awareness of the cheaper and more energy conserving stabilised and compressed earth bricks as an alternative to the sandcrete concrete blocks commonly used all over the country.

The stabilised and compressed earth brick is basically a development over the age long local adobe bricks by the addition of a regulated percentage of cement aggregates. They are meant to cater for the inadequacies in the compressive strength as well as absorption quality of the local adobe and burnt bricks. These types of development in building materials are not a new phenomenon in Nigeria. Precisely before the year 1928, all public as well as private buildings in Nigeria were constructed of fired clay bricks which were popularly produced by the Ishiago brick factory. But when the government realised in 1928 that it was no longer economical to keep the factory, the Public Works Department (PWD) gradually replaced bricks with sandcrete blocks. These changes were not accepted by the public until around the year 1940 (Mandeleo). Due to the increase in the demand for the sandcrete bricks, many private individuals went into commercial production with the hand moulding machines. As the demand increased towards the 1960s, new improved automatic producing machinery were popularised. Some of the leading production companies in Nigeria at the time, include the Nigerian Cement Industry. Generally, the compressed and stabilised earth was introduced into the building industry in Nigeria due to the recent glut in the economy and the accompanying high cost of building materials. This development made the cost of sandcrete blocks astronomically, far beyond the reach of the common masses. Although, the stabilised and compressed earth bricks are just been popularised in many advanced countries of the world like the USA, Australia, Belgium, Brazil, India, New Zealand and host of others had been enjoying the patronage of these materials over a long time.

water absorption as low as 18% as well as dry compressive strength of about *2.O-2.5/mm²*. This is achieved with 5% cement stabilisation. Ola (1983) revealed that an average strength 1.4N/mm² is adequate for bungalow buildings, and most stabilised and compressed bricks have more than 1 *.6N/mm²*.

The compressed bricks have a unique quality of being more homogenous due to the amount of pressure applied on it. Several millions of very small particles of air voids usually exist between the particles of sand and clay. They actually play a major role in the thermal performance. On special circumstances, where both the indoor and external temperature is the same, a permanent state condition is established. Rather than this a flying effect of temperature variation is common in the stabilised and compressed earth houses. This is a situation whereby *there is a variation in both the indoor and outdoor* temperature. *Ola (1985)* conducted a research on the stabilised and unstabilised but compressed lateritic soil bricks at various densities. The results lie between 0.5 and 1.5 W/M^{0}C. While another test on unstabilised soil (but not compressed), lateritic soil bricks. The results confirmed that compression helps in improving the thermal capability of the bricks.

A similar research conducted by Adesanya (1988) on the thermal conductivity of mud walls and sandscrete blocks in Ile-ife, Osun state, Nigeria revealed the following, while mud bricks gave 0.5-0.9W/M°C, sandcrete blocks gave between 0.88 and 1.4W/M°C. This also confirms that mud bricks have better thermal capability over the sandcrete blocks.

In a related research carried out by Adeagbo (1999), a pattern of relationship between the compressive strength of a sandcrete cubes using sawdust/sand cubes mix. Though, Adeagbo research was intended at establishing the water cement ratio on the properties of the sandcrete mix especially when partially replaced with sawcrete, the performance result of the sawcrete was quite amazing with a proportion mix of 1:4:2 (cement, sand and sawdust) producing a compressive strength of 5.69 N/mm2 with water cement ratio of 0.80 at 28 days hydration.

The beauty of Adeagbo's study was the attainment of a good workability of each mix under a tropical temperature of 27 + 2°C. The sawdust and fine aggregate used were made wet and subsequently air dried in the laboratory for 48 hours.

The properties of sawdust are at the average,

Apparent specific gravity, 1.10%,

Water absorption, 27.2%
Loose Bulk Density, 234.50Kg/m3,

Compacted Bulk Density, 335.00kg/mm3,
Porousity, 23.05%.

According to the Sieve Analysis of Sawdust and Sand test on table 3, sawdust was used as a fine aggregate while specially sourced river sand was used as the coarse aggregate. This implies that the blocks produced from this mix will be ideal for moderate structures. This invariably attests to the workability of alternative materials for sustainable housing delivery under the on-going structural adjustment scheme in Nigeria.

The Housing Cooperative Scheme

The stabilised and compressed earth brick technology, if well structured could effectively be utilised under the 'housing cooperative scheme' - a scheme set up by the people, for the people and *managed by the people for the mutual housing* benefits of the members. The concept **'co-operative housing'** was defined by Wahab. (1988) as the co-operation of people or families, organised as a group to provide housing for members of the group. Awotona (1989) saw co-operative housing as a form of self-help housing with a clear philosophy that people should do more for themselves, far more than what other people are currently doing for them. In Awotona's analysis, co-operative system might sound new in the housing sector of the national development, it is certainly not a new phenomenon in the socio-economic sector of many Nigerian societies. He cited the third National Development Programme (1975 - 1980) where the Federal government promoted the setting up of some apex organisations under the auspices of the Co-operative Division of the Federal Ministry of Labour. These organizations include the Co-operative Federation of Nigeria Limited.

(b) The Nigerian National Co-operative Wholesale Association Limited.

(c) The National Co-operative Insurance Society Limited.

(d) The National Association of Co-operative Credit Union of Nigeria Limited.

Wahab 1988, one of the strong advocates of Co-operative Housing Scheme in Nigeria traced the origin of the concept to time immemorial, when individual wishing to own a house seek help readily from relatives, in-laws, neighbours as well as friends. This was very popular when buildings construction depended on about 80-90% of locally available materials. This was the era where all the materials needed for a house could be readily got from the

environment of the building site. to Wahab, (1988) in his series of in the Studies in Environmental Design ica Vols. 9 & 11, some of the common ffered by the community includes free building materials and food for the ab (1988) attributed the sudden stoppage cept on the fast growth of the wage this made it difficult to obtain free

strength of the co-operative housing expressed by Olajide (1992) where he scheme as not pursued as an abstract a general formula, rather as an action people, by people and of people. This the grass root marks the strongest the scheme as it recognises common gst its members, mutual benefits as well posture. The breakage of the obnoxious coupled with the frustrating exploitative of middle men as well as artisans make a positive development in the field of tribution as it is generally a non-profit eme. The scheme also accentuates the cultural context of housing needs of the all other considerations. Housing should a cultural activity aimed at housing form of a home, and of adaptation to nments. Awotona, (1989). Such symbolises the values, desires, and bilities of the people as a group.

'Co-operative Housing' should not be attempt or a scheme that merely satisfies state of existence within a minimal environment or as an attempt to housing mediocrity or substandard rather it should be seen as a step that human basic needs with the minimum society and environment, (taking the socio-economic as well as cultural owners and users) and later pursue a of needs and aspiration that justifies caprices of the users. The technology the level of development of a people aim of maximising the potential the people with minimal disruptive the ecological and socio-cultural (Olajide, 1992).

and compressed earth brick technology more and more popular in developed ecause of its immense tested qualities due to its thermal mass performance, as intenance cost and its natural beauty.

The success of the earth construction technology is a good rediscovery and re-activation of the lost vernacular architecture while the stabilised and compressed earth brick is a further development over the lost glory in order to keep the general masses hopeful of effective and sustainable housing delivery. The application of the housing cooperative system would enhance the achievement of a sustainable housing programme for the people. A policy developed by the relevant authority in housing would popularise this technology and such enhance housing development in Nigeria.

The current housing policy in Nigeria (2000-2005) where all efforts are geared towards the public-private partnership in housing delivery has certainly neglected the average and lower class of the economy due to cost. For this class of people to be accommodated in the housing delivery scheme, the stabilized and compressed earth brick option be popularized under the cooperative housing scheme and a policy be established to back it up.

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Table 1: **Cost of Cement per 50Kg Bag (WAPCO) Price in Nigeria. (1990 – 2005)**

Years	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2003	2005
Amount in Naira	32	40	85	85	180	410	430	500	550	600	650	850	1000	1500

Source: field study, 2005

Table 3: Sieve Analysis of Sawdust and Sand.

Sieve Size	%Passing Saw dust	Sand
4.75	99.60	97.00
2.36	97.20	84.00
1.18	93.00	55.00
600um	30.40	30.00
300um	9.20	16.30
150um	2.80	7.80
75um	0.80	1.30
Pan	0.00	0.00

Source: Adeagbo, 1999

DATE	IBRD			IDA			Total		
	Principal	Charges	Total	Principal	Charges	Total	Principal	Charges	Total
01-JUL-04	2,561.51	140.31	2,701.82	104.99	225.70	330.69	2,666.50	366.01	3,032.51
15-JUL-04	5,399.07	1,020.77	6,419.84	1,074.56	603.09	1,677.66	6,473.63	1,623.86	8,097.49
01-AUG-04	8,516.98	1,648.64	10,165.62	0	195.80	195.80	8,516.98	1,844.44	10,361.42
15-AUG-04	7,516.00	1,502.82	9,018.82	1,975.30	689.62	2,664.92	9,491.30	2,192.44	11,683.74
01-SEP-04	0	0	0	270.02	364.30	634.32	270.02	364.30	634.32
15-SEP-04	5,628.75	601.67	6,230.42	1,881.75	778.61	2,660.37	7,510.51	1,380.28	8,890.79
01-OCT-04	2,530.67	495.94	3,026.62	1,304.95	502.21	1,807.16	3,835.62	998.16	4,833.78
15-OCT-04	43,012.04	8,245.70	51,257.74	0	0	0	43,012.04	8,245.70	51,257.74
01-NOV-04	3,406.05	1,395.66	4,801.71	345.33	97.12	442.45	3,751.38	1,492.78	5,244.17
15-NOV-04	23,563.30	4,623.73	28,187.03	1,684.50	1,193.81	2,878.31	25,247.79	5,817.54	31,065.34
01-JULY-37	0	0	0	1,939.73	21.82	1,961.55	1,939.73	21.82	1,961.55