THE USE OF LOCAL BUILDING MATERIALS FOR THE CONSTRUCTION OF FARM STRUCTURES IN WESTERN NIGERIA.

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ABSTRACT

A Survey of the pattern of usage of building materials in the small - to - medium farms in Western Nigeria was undertaken. Wood was the commonest construction material in use, followed by earth products and natural fibres. Decay and weathering of natural fibres including timber; and the erosion of earth products were the major problems experienced with their uses. Treatment of the natural products before use was found wanting. Adequate seasoning and preservative treatment of natural fibres and earth stabilization are recommended for durability. Cost is a vital consideration in the choice of construction materials for farm structures. The choice of local materials goes some way to reduce cost. Numerous improvements on performances of some local materials have been devised in the Research Institutes. There is a need for effective extension linkage between the research institutions and the farmers.

KEY WORDS

Farm Structures; decay; Wood; earth, natural fibres.

1.0 INTRODUCTION

Shelter is one of the three basic essentials of life and in the farming community, farm structures to a significant extent determine the performance of the farmer; the productivity of his livestock, storability of his produce and the longevity of his farm machinery. These are achieved through the protection of harvested crops; equipment; livestock and the farmer from adverse weather conditions such as extremes of temperatures and relative humidity, and protection against predators and pilferage.

Farm Structures are facilities either purposely designed and fabricated or remodelled to serve a desired purpose on the farm. Occasionally, some farm structures may be located off-farm. Farm structures include farm houses, buildings for crop production, processing and storage, livestock building, buildings to house equipment and supplies, and others such as fences and farm roads. Because of this wide range of facilities that constitute farm structures, it has often been said that in the absence of farm structures, the practice of agriculture would be difficult. The farmer irrespective of his scale of production has always striven to provide farm structures relevant to his need taking into account his economic situation, technical know-how and the materials of construction at his disposal.

A resting place for the farmer was the earliest type of farm structure. It was constructed with wood cut from plants with the leaves serving as roofing materials. The farmer progressed to the use of mud which was later improved upon by moulding it into blocks and burning (1). Concrete and other materials were developed with time and at present; a catalogue of building materials are available.

The overall cost of farm structures like other construction projects, is the summation of the cost of construction materials and labour for erection. Studies carried out on housing revealed that the materials of construction alone could account for as much as 60% of the total building cost (2), while the costs reduction potentials in the use of local building materials was found to vary between 30 and 80% compared to when conventional building materials are used (3). Although the studies reported were for urban housing, the results are applicable to farm structures since the materials of construction and labour are sourced from the same market. Various efforts are currently being made by both individuals and government through the various States' Agricultural Development Projects at boosting agricultural production especially at the smallholder farmers' level.

There is the need to provide the farmer with a conducive farming environment and appropriate farm structures if the goals of the various efforts are to be realised. Considering the poor economic situation of most farming communities in Nigeria, efforts should be made towards providing such appropriate farm structures at minimal cost. The use of local building materials is considered to be of great potential in this regard.

This paper discusses the results of a survey carried out in Western Nigeria to identify the available local building materials, their utilization and constraints, and possible areas of improvement.

2.0 METHODOLOGY

This survey was carried out in Western Nigeria comprising of Ogun; Ondo; Osun and Oyo States. For the purpose of this study, a local building material was defined as a material which is readily available in the environment under reference, suitable for use and for which local expertise exists for its exploitation for the construction of farm structures.

Information gathering was accomplished using structured questionnaires which sought to know the type of local building materials available; material utilization; durability of farm structures constructed from such materials and factors governing the choice of materials. Additional information items were gathered through personal communication and on the spot assessment while administering the questionnaires.

A total of sixty locations which were representative of the various farming systems and cultural practices of the entire area were surveyed. They cut across smallholder farmers mostly resident in rural areas, private commercial and government farm settlements, and farms of teaching and research institutions.

3.0 RESULTS AND DISCUSSION

The results of the survey are summarized in Table 1. The local building materials found are grouped into wood; earth and earth products, natural fibres and bamboo. These materials were analyzed on the basis of availability, utilization, limitations, choice of material and durability.

3.1 AVAILABLE LOCAL BUILDING MATERIALS

(a) WOOD:

The area of study is the rainforest which is the source of most Nigerian timber supply. A variety of timber species such as Afara, Idigbo, Iroko, Mahogany, Mansonia, Omo and Opepe are available from both the government and saw-milling are common place in the area. The technology for wood working is well developed and available at the most remote villages. The above reasons coupled with the suitability of wood for many components of buildings and structures account for the extensive use of wood in the construction of farm structures. In terms of volume and distribution, wood is the most commonly used of the available local materials. It is used for walls of farm houses and livestock buildings; wooden bridges (Plate 1), yam barns, columns and trusses for sheds; drying platforms and many other structures.

Adequate seasoning and preservative treatment of wood before use was found wanting in some places. Some of such structures were found to have been attacked by fungi and insects especially termites. Weathering as a result of repeated cycles of wetting and drying was also observed although in very rare cases.

(b) EARTH AND EARTH PRODUCTS:

These include clay and laterite suitable for building constructions; sand and stones. Although these materials are as available as wood, and can be worked with unskilled and occasionally cheap skilled labour, their use is not as extensive as that of wood. This is as a result of their limitation of foundation and floor construction and occasionally for walls.

Earth or mud clay is used in farm structures both in the form of mud and as sundried blocks or adobe. It is used mainly for walls of farm houses and deep litter houses for poultry. When compacted, earth could be used as a flooring materials for most structures provided it is not cleaned by washing. As a result of the low resistance of earth to water penetration, erosion of mud walls due to rainsplash and overland flow is a major problem. In rare cases, cracks could develope on the wall resulting in structural failure.

Stones are either obtained from natural ground surface or dug-up and washed to remove the organic materials and other impurities that may reduce their strength while in service. Stones vary in sizes ranging from pebbles which are used as coarse aggregate for concrete work to rocks which can be crushed to smaller sizes and used for foundations and walls. Plate 2 shows a stone-walled building.

Sand is obtained from either roadsides or riverbeds. It is used as a fine aggregate in concrete work and when mixed with cement alone, it gives a mortar which is a good binder for both foundation and wall construction, and for plastering.

(c) **NATURAL FIBRES:**

The materials collectively referred to as natural fibres include assorted grasses, banana leaves, palm fronds; twigs, canes, stems and branches of shrubs, assorted leaves and ropes. They are used as roofing materials for sheds (Plate 3), covering of piled or stacked farm produce especially on the farm, fencing and reinforcement of mud walls. When used for roofing, the materials are well packed together and overlaid in such as manner that is gives some resistance to water penetration while the roof is made as steep as possible to allow for flow of water over the thatch rather than penetrating through it. When used for fencing, it could wither be woven or attached directly to posts. Natural fibres are highly combustible and prone to decay, fungi and insect attacks against which appropriate measures should be taken. Annual replacement of these materials due to either indiscriminate burning or decay is a common feature.

(d) **BAMBOO:**

Bamboo: is a perennial grass of both the tropics and sub-tropical climates, hence it thrives well in the area under study. It is used for the construction of sheds (Plates 3); cribs, drying platforms and as a reinforcing material for mud walls. As a result of its high starch and moisture content, bamboo is susceptible to fungi and insect attack. The material is also highly combustible and there were reported cases of accidental burning of bamboo structures erected on farms from bush burning where no adequate protection against fire was made.

3.2 COST AND CHOICES OF BUILDING MATERIALS:

Within the study area, quite a number of farm structures were found constructed using conventional building materials such as concrete and steel on the components for which the available local materials could have been used. Investigation revealed that the choice of building material for farm structures is influenced by the economic potential of the farmer. The more prosperous farmer uses the conventional material which are more durable but expensive while the farmer with very meagre resources will use the local materials, their demerits notwithstanding since that will be within his reach. This observation tends to support the assertion of Barre and Sammet (4) that "in periods of economic depression, the tendency is for more emphasis to be placed on the use of native materials." The cost of all categories of construction materials is becoming increasingly expensive and if in the Nigerian context, the economic situation of the farming community relative to the industrial sector remains unchanged, more and more local materials either natural or fairly improved will continue to be sourced and used for farm structures.

3.3 DURABILITY OF BUILDING MATERIALS

Although durability varied with the type of material as expected, for most of the material is used before its replacement or major repair was dependent more on the need to remodel the structure in which it is used rather than its useful life. Reasons that my necessitate such remodelling include increase in family size and hence the expansion of the farm house and economic prosperity resulting in the replacement of some of the local building materials with conventional ones; an example being the replacement of a thatched roof with corrugated iron or asbestos roofing sheets. The durability of some of the building materials as found during the study are presented in Table 1.

4.0 CONCLUSIONS

The local building materials for farm structures in Western Nigeria are timber, earth and earth products; natural fibres and bamboo. These materials are extensively used in various components of farm

structures. The choice of local building materials for farm structures is influenced by economic consideration. The period over which a material is used before its replacement as a component of a building is dependent more on the need to remodel such buildings rather than the useful life of the material.

Fire hazards and decay of natural fibres and bamboo; timber weathering and erosion of earth products are some of the limitations to the use of these materials. These problems notwithstanding, in the light of ever increasing cost of conventional building materials and the poor economic situation of the farming communities, indications are that these materials will be used more extensively than at present. It is even envisaged that in the near future, both urban and rural housing may compete with farm structures for the use of these local materials.

5.0 RECOMMENDATIONS

To further exploit the potentials of these local building materials, the following recommendations are made:

(a) During this study, it was found that some Research Institutes such as the Nigerian Building and Road Research Institute (NBRRI) have made efforts to eliminate some of the deficiencies associated with these local materials especially the earth products which can be accommodated within the limited resources and technology of the Nigerian small-scale farmers. An effective extension linkage between the Research Institute and farmers is necessary to ensure the transfer of such valuable simple technologies.

(b) Most of the problems experienced with timber and bamboo in service can be eliminated through adequate seasoning before the material is used. The use of chemical preservatives such as solignum; creosote and Copper-Chrome-Arsenate formulations for timber and Aldrex 40 for bamboo will further prolong the service lives of structures constructed of these materials. Natural fibres should equally be impregnated with fire retardants such as Ammonium sulphate and Zinc chloride to reduce their combustibility while the use of chemicals applicable to timber and bamboo could improve their resistance to insect and fungi attack.

(c) The erosion of mud walls is often concentrated in the lower part of the wall and it is a combined effect of rain splash and overland flow. It is recommended that the walls should be plastered from the ground level to a few centimetres above.

(d) To extend the use of these building materials beyond the construction of farm structures, design codes such as those already available for timber in building construction (5) should be developed for the other local materials.

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Table 1

Information on Local Building Materials availables in Western Nigeria

Building Material	Utilization	Problems experienced with the use of the material	Durability
Wood Products	Construction of walls of farm houses and poultry buildings; wooden bridges; crop storages sturctures such as cribs, barns and platforms, beams, columns and trusses for various structures.	(i) Attack by fungi and insects especially termite resulting in decay. (ii) Weathering.	(i) Farm houses 10-15 yrs (ii) Bridges 5-8 yrs (iii) Crop storage sturctures, up to 10 yrs
Earth products including clay, sand, laterite and stones.	Clay as mud or adobe block is used for wall of farm houses and deep litter houses and floors. Stones are used for foundations and occasionally for walls. Sand is used as as fine aggregate for concrete and when mixed with cement, it is a binder for foundation and wall construction.	Erosion of mud walls by rainsplash erosion and over-land flow. Cracking of mud walls.	Because the eroded portions of the walls are regularly patched, walls can last for up to 15-20 yrs. Foundations are almost permanent
Natural fibres	Roofing of farm houses and sheds; fencing and reinforcement of mud walls.	Highly combustible and prone to fire attack. Susceptible to attack by fungi.	For farm houses, this varies between 4-8yrs but for others, the period is less and in some cases, replacement is annual.
Bamboo	For the construction of sheds, cribs, drying platforms, fences and mud wall reinforcement.	Fungi attack and fire due to the high combustibility of the material.	5 - 10 yrs.



Plate 1: Wooden bridge at Ogun State A. D. P. Odeda

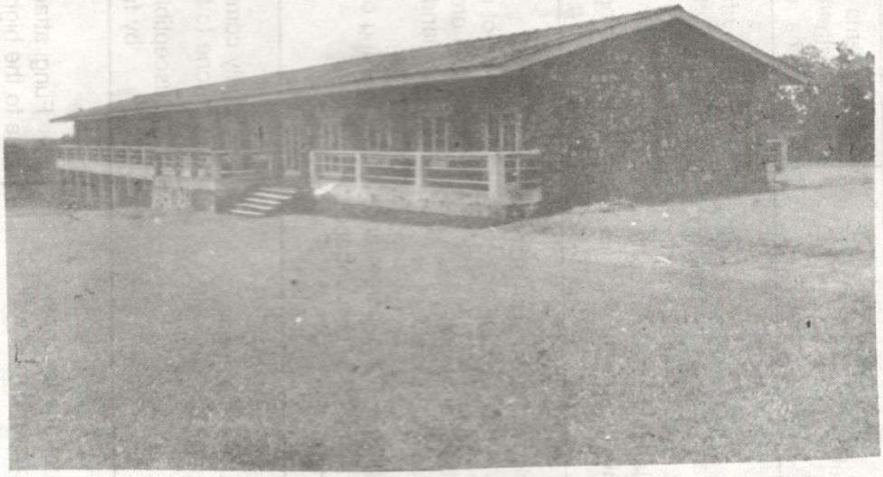


Plate 2: Stone walled building at Farm Institute, Eweje, Ogun State



Plate 3: Bamboo shed with palm fronds as roofing material