

CLASSIFICATION AND EVALUATION OF CROP STORAGE STRUCTURES IN WESTERN NIGERIA

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ABSTRACT

A survey involving the use of questionnaires and personal communication during field trips was carried out in Western Nigeria with the aim of classifying and assessing the efficiency of the existing structures for the storage of crops. Barns; cribs; trenches; platforms; warehouses and silos are among the important storage structures. The existing structures could be efficient with proper management but a major limitation of most of them is the low unit capacity which is inadequate to cope with the present volume of agricultural production. Research efforts should concentrate more on improving the existing structures rather than their replacement.

Key Words:

Improved; Condensation; Preservatives; Post-harvest; Durable.

INTRODUCTION

The roles of food crops in the existence of man and his livestock are quite obvious and numerous and when account is taken of the fact that nearly all crops are seasonal except where irrigation is practised, the need for crop storage cannot be over-emphasized. The various efforts of individuals, corporate bodies and the government directed at increasing food production in Nigeria in the past two decades have resulted in increased harvestable crops but the impact has not been felt because between the time when the crops are harvested and when consumed, severe losses are often recorded.

In Nigeria, crop storage is faced with a number of problems ranging from inadequate and inefficient storage structures for some crops to non-existence of storage structures for others. As a result of the climatic variation across the country, the problems experienced with crop storage also vary from one place to another. For example, the humid environment of the South favours the development of insects and other micro-organisms that infest stored produce while these problems are less pronounced in the drier climate of the North⁽¹⁾. Inefficient post-harvest handling of crops in Nigeria inclusive of inadequate structures has resulted in losses reaching as high as 20-30% of total grain production, 30-50% for roots and tubers while for vegetables and fruits, the loss could be total resulting in colossal loss of money⁽²⁾. With emphasis on farm mechanization and the expected increase in harvestable crops coupled with increasing dependence of agro-based industries on local raw materials, there is the need to provide good storage structures for the

preservation of the agricultural products that have been harvested.

The climate of Western Nigeria is characterized by two seasons. These are the wet season which lasts from April to October with an annual rainfall of between 1500 mm and 2000 mm. The dry season lasts from November to March. The vegetation is forest. The area has great potentials for the production of numerous crops which must be adequately stored. The objectives of this work are therefore to identify the structures that are available for the storage of crops in Western Nigeria, classify them and assess their adequacies in relation to the present and expected future increase in volume of agricultural output.

METHODOLOGY

This study was carried out in South Western Nigeria comprising Ondo, Osun, Oyo and Ogun states. Personal communication during field visits and the use of questionnaires administered both by hand and mail were employed in gathering information. Information sought included the types of structures available, their utilization and problems associated with their use. The survey cuts across all sectors involved in the production, processing and distribution of agricultural crops. These include private and government farms, farm settlements, Educational and Research Institutions; markets and transit centres, storage depots, Local Government Area Offices of the Ministry of Agriculture and Agro-allied industries. There was reluctance on the part of some respondents especially traders and large scale farmers to provide information. Such reluctant respondents mistook this study for a government project aimed at assessing their income for the purpose of taxation and a price monitoring exercise.

RESULTS AND DISCUSSION

The results of the survey are presented in Tables 1 and 2. A crop storage structure is any place or thing that is employed for the purpose of keeping agricultural produce. On the basis of primary aim of manufacture and the level of technology involved, the crop storage structures found in Western Nigeria can be classified into three. These are the improvised, traditional and modern storage structures.

The improvised crop storage structures refer to those items or containers whose original purpose of manufacture was not for the containment of crops but which over the years have

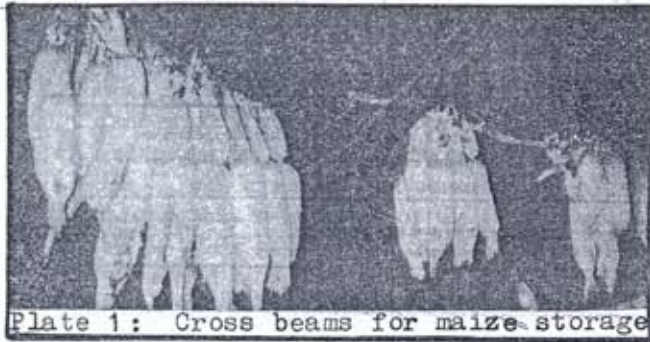


Plate 1: Cross beams for maize storage

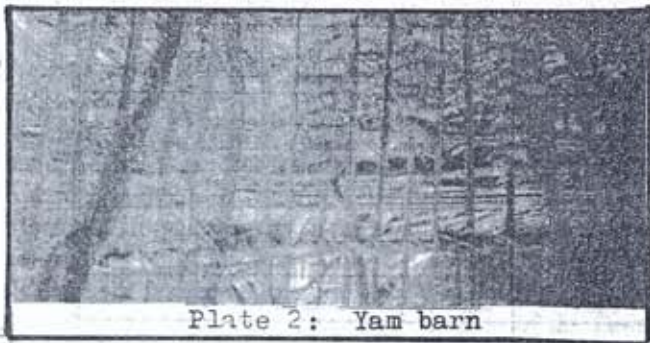


Plate 2: Yam barn



Plate 3: Exposed platform (Yams in place)



Plate 4: Traditional Crib

been found convenient for use in storing food crops. They are characterized by low storage capacity which accounts for why they are mainly used for the storage of food for household requirements and occasionally for seeds of various crops. These structures are quite efficient especially since they can be made air-tight to provide a controlled atmosphere and they can be used to store agricultural produce for up to 24 months. This group include earthen pots, tins and bottles, parts of residential buildings, drums and bags.

The traditional crop storage structures refer to those structures which are indigenous to the area under study and the primary objective of construction of which was for the storage of crops. They are characterized by readily available materials of construction and low level of technology for their construction which is also readily within the region. This group of structures, which are mainly used by the peasant farmers for on-farm storage, caters for over 75% of the total crops stored in the area. As a result of the widespread use of this group of structures, they have been severely criticized by various experts in crop storage. This group of structures include palm frond woven baskets, barns, cribs, underground pits and trenches, platforms and ventilated sheds (Plates 1 to 4).

Modern storage structures are the results of research efforts aimed at improving the non-efficient existing structures and the search for new ones to cater for those crops for which none is currently existing. This group includes silos for bulk storage of grains, wooden crates filled with sawdust for cassava crops. Except for the use of silos and warehouses; the modern storage structures are still under test and have not been commercialized.

During the survey, a number of problems were identified with the existing structures:

- (i) Users of cribs and barns complained of buckling of supporting posts and columns and in some instances, total collapse of the entire structure. This was traced to overloading, windload and attack by insects and rodents on the wooden components of the structures. Such failures result in bruising and breakages of crops such as yams thus creating avenues for insects and other micro-organisms to enter the product. Exposed surfaces are potential locations where rotting might begin while the products stored in a collapsed structure are easily accessible to rodents.
- (ii) Weevil and insect infestation were observed in crops stored in bags and baskets but these organisms were believed to have followed the crop from the field rather than the infestation taking place during storage.
- (iii) Users of non-ventilated metal Silos complained of the development of hot spots and mould growth within the core of the stored grains and caking around the circumference of the Silo wall. This is as a result of the warm humid climate of the environment which is characterized by generally high temperatures, wide daily temperature ranges and high relative humidity for a significant part of the year, the effect of which is the rapid flow of heat from the surroundings onto the enclosure and the condensation of moisture on the inner surfaces of the structure.

Table 1: SUMMARY OF EXISTING STRUCTURES AND UTILIZATION IN WESTERN NIGERIA

Storage structure	Capacity Range in Tonnes	Possible Storage Duration in months	Crops for which the Structure is being used.
Bags or sacks	Up to 0.1	3-16	Grains; legumes; cocobeans; kolanuts; palm kernel; onion and pepper.
Palm frond woven basket	Up to 0.2	1-3	Baskets are used for temporary storage and as transport structure for all crops including cassava tubers.
Building components such as deckings, roof trusses and platform over cooking places	Up to 1	1-24	Grains and legumes
Drugs/provision/beverage tins and bottles		3-20	Grains; legumes; vegetable seeds.
Earthen pots and gourds	Up to 0.1	2-20	Grains; legumes; pepper, vegetable seeds.
Drums and plastic containers	Up to 0.6	1-12	Grains and legumes
Wooden crates filled with saw dust	N.A.	N.A.	This is only presently being experimented for possible storage of cassava tubers.
Unoccupied living rooms and Warehouses	Up to 1,000	1-16	These are used for the storage of all crops although some packaging is often necessary before the final storage. It could be direct heaping of material on the floor or bagging and stacking.
Crib	2-9	1-12	Cowpea, soybean; maize, yam, tobacco and plantain
Silos	20-840	1-18	Maize, cowpea soybean and rice.
Trenches and underground silos	Up to 2	1-6	Yams, maize and cassava (Unharvested).
Exposed, covered and ventilated platforms.	Up to 5	1-6	Yams; Tobacco, Yams, Grains, Legumes
Barns	Up to 5	1-12	
Evaporative cooler	N.A.	N.A.	This is only presently being experimented for possible storage of perishable crops.

Table 2: CLASSIFICATION OF CROP STORAGE IN WESTERN NIGERIA

IMPROVISED STRUCTURES	TRADITIONAL STRUCTURES	MODERN STRUCTURES
(1) Building Components and unoccupied living rooms	(1) Barns (Yam, Tobacco)	(1) Warehouses
(2) Drugs/Provision/beverage tins and bottle	(2) Cribs	(2) Silos
(3) Earthen pots and gourds	(3) Underground pits and trenches	(3) Wooden Crates filled with sawdust
(4) Drums and plastic containers	(4) Specially constructed palm frond baskets	(4) Evaporative Cooler
	(5) Platforms	

- (iv) One obvious limitation but which none of those interviewed raised was the low unit capacity of some of the structures to cope with the capacity of some of the structures to cope with the present and future expected increase in the volume of production. The farmers do not consider this serious because they believe that if the need arises, a number of the same type of structure can always be constructed to provide their required volume of storage.

CONCLUSION

The crop storage structures in Western Nigeria are mainly traditional except in very few large scale agro-allied industries and storage centres where silos and warehouses are found. There are two problems besetting crop storage structures in Western Nigeria. The first is the inadequacy in terms of storage capacity of the existing ones to cope with the volume of production while the second is the non-existence of storage structures for a number of crops especially the fruits and vegetables. In spite of the flaws associated with the existing structures which are predominantly traditional, there is no evidence that the peasant farmers who produce and store well over 75% of the total food output in the area are prepared to do away with these traditional structures. Reasons vary, ranging from cultural beliefs and attachment, cheapness of structures to ease of management. The traditional storage structures will for quite sometime, continue to be used for a large percentage of crops produced and hence any attempt at solving the problem of crop storage structures in Nigeria should dwell more on methods of improving the existing ones rather than their replacement.

RECOMMENDATIONS

Research efforts aimed at providing storage structures should concentrate more on ways of improving the existing ones rather than the introduction of new ones. New structures should only be introduced in situations where no traditional alternative exists while the introduction of a new structure must take into account the environmental, economic and technological level of the community targeted to benefit from it.

Low unit capacity was identified as a major problem besetting the existing structures. Research work on these structures especially the crib, barn and trenches aimed at increasing their storage capacities is necessary.

Wood will continue to play a major role as a constructional material in crop storage structures. The problems of decay and termite attack should be curtailed by the use of durable

species and adequate chemical preservatives before use and while in service.

To extend the use of silos; there is the need to find alternative materials that can eliminate the climatic problems associated with the existing metal ones.

There must be adherence on the part of the farmers to specifications as regards the selection of members for various structural components, construction techniques and loading to guide against structural failure. Cribs should be diagonally braced to keep their walls plumb and resist wind load.

Co-ordinated storage system has been practised twice in Nigeria both of which showed some level of success. The first was in 1957/58 by the Western Regional Ministry of Agriculture and Natural Resources while the second was in 1987 by the Oyo North Agricultural Development Project in Oyo State^(3,4). The operations of both schemes were the same and it entailed the provision of crop storage structures at centralized locations while individuals and co-operative farmers were encouraged to bring their crops for storage at a reasonably low charge. This method should be encouraged as it lessens the burden of acquiring the structure at one time when there is bumper harvest and underutilization of the structure at some other time when harvest is poor. The government should also arrange for the fabrication of some of the storage structures and make them available to the peasant farmers at subsidized rate.

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