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Grasses: Their Use in Building

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GRASSES - THEIR USE IN BUILDING

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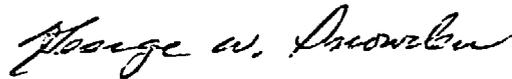


DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
DIVISION OF INTERNATIONAL AFFAIRS
WASHINGTON, D.C. - 20410

FOREWORD

This leaflet presents information on the uses of grass in building houses. It was prepared by Jason R. Swallen, Head Curator, Department of Botany, Smithsonian Institution, Washington, D. C.

The material was prepared in 1955 at the request of the Housing and Home Finance Agency (now the Department of Housing and Urban Development). It has been reviewed by the author and is being reprinted for the use of overseas Missions of the United States Agency for International Development.



George W. Snowden
Acting Director
Division of International Affairs

INTRODUCTION

Grass has been used in the building of native huts and houses since the earliest times, especially for thatching for roofs. Accepted as a primitive method, little attention has been given to it, and accounts in literature are very few, especially as to the methods used. What data there is, is usually mentioned incidentally, and mostly confined to a statement that a given grass is used for thatching.

Since so few studies have been made on the subject, any housing project which would involve the use of grass for thatching or other purposes, should be preceded by a careful study and evaluation of the methods and types of grasses used in the area. From many years experience, natives could give information of prime importance, which might otherwise be overlooked.

It is realized that the information given herein is inadequate. It may be of value, however, as a basis for further studies.

DISTRIBUTION AND EXTENT OF USE

The grass family is more widely distributed than any other plant group, occurring from sea-level almost to the altitudinal limits of vegetation and from the Tropics to the Arctic and Antarctic. Grasses are the most important plants to man, although the variety of uses is probably not as great as that of some other groups. Their use in construction of houses is very limited, especially excluding bamboos which are considered separately. They are most important in primitive areas where other materials are either not available or are too expensive.

STRUCTURAL USES FOR WHICH GRASSES ARE SUITABLE

The primary use of grasses in construction is for thatching, both for roofs and walls, although the coarser reeds are used as lathing on walls, ceilings and partitions, and rafters for tile roofs. Grass sod is used in some places, as in the high Andes and southern Brazil, and undoubtedly other regions as well. Rather large blocks are cut and used as bricks in constructing walls.

SELECTION OF GRASSES

In general, palm leaves are preferred for thatching and grasses are used in regions where palms do not occur. Many different grasses are satisfactory, those used depending on what is available in the region. Usually they are native grasses, but where cereals are grown, the straw is often used. Most grasses which are rather tall and erect could be used for thatching, but some species would be more durable than others. Where thatching has been used for covering roofs, selection of grasses probably has been based primarily on this factor. The length of time a thatched roof would last depends very much on the climate. In dry areas it might be many times as long as in wet humid places, such as the Tropics. Possibly the more fibrous grasses give longer service. Variation in a species, except that of size, is not likely to be of any importance.

Some grasses which have been especially noted as being used for thatching or other construction purposes are given below, including the statement of their value, and the region where they are used. The list is undoubtedly very incomplete, but does contain some of the best which are commonly used.

India

Desmostachya bipinnata (L.) Stapf. "A good thatching grass."

Imperata cylindrica Beauv. "Much used for thatching."

Chrysopogon gryllus (L.) Trin. "The best of thatching grasses."

Saccharum spontaneum L. "One of the best grasses for thatching."

Saccharum munja Roxb. "The leaves are largely used for thatching."
A fiber from the upper sheaths is used for making mats.

Saccharum arundinaceum Retz. "Walls of native houses are constructed from the culms."

Sclerostachya fusca (Roxb.) A. Camus. "Used for thatching and kutcha walls."

Themeda gigantea (Cav.) Hack. "Used for walls of native huts."

Heteropogon contortus (L.) Beauv. Largely used as a fodder plant but also for thatching.

Malay Peninsula

Imperata cylindrica (L.) Beauv. Cogon Grass; Lalang. "Sometimes lalang leaves are used for thatching, but not where Nipa ataps are procurable. In the interior of Pahang it is sometimes seen on roofs, chiefly of Chinese houses. An eight-inch thatch of lalang, of course, weighs a great deal more than a coating of ataps, and the supports of the roof must be stronger than usual. The roof should be steep, and then the lalang thatch lasts two years against three for an atap thatch; and if it be made very steep the thatch will last longer, even up to 6 years. There are parts of Malaysia where lalang is deliberately encouraged because it is wanted for thatching, but these are where the climate is much drier than in the Malay Peninsula."

Phragmites communis Trin. Used for thatching. Where bamboos cannot be obtained, stems are used in their place in making ribs of ataps.

Arundo donax L. Probably used for thatching and construction of walls; also for windbreaks, trays, mats, etc.

Hawaii

Heteropogon contortus (L.) Beauv. Considered the best thatching grass in the Islands.

Fiji

Miscanthus floridulus (Labill.) Warb. Apparently universally used in Fiji for thatching.

Andes

Arundo donax L. Used as lath in framework of native huts, wall coverings, etc.

Gynerium sagittatum (Aubl.) Beauv. Same uses as *Arundo*, as well as ceilings and partitions. Tied in small bunches, the stems are used as rafters for tile roofs. Considered very good for the purpose because they last a very long time.

Calamagrostis effusa (H.B.K.) Steud. Used for thatching where palms are lacking. Has long-lasting qualities.

Stipa ichu (Ruiz & Pav.) Kunth. Commonly used as a thatching grass, especially for sod huts in the high Andes.

Brazil

Andropogon bicornis L. Sometimes used for thatching in Para.

Panicum prionites Nees. Sparingly used in southern Brazil for thatching and wall coverings of temporary houses and sod huts.

Europe

Triticum aestivum L. Of the cultivated grains, wheat straw is usually used. It is laid 12" - 18" thick, and roofs so covered are said to last as much as 30 years.

Bromus tectorum L. Said to be used for thatch in humid parts of the Old World.

Africa

Arundo donax L. Commonly cultivated in Egypt for fences and breaks, and roofing of farmers' houses as well as for other purposes.

Imperata cylindrica (L.) Beauv. Mentioned as a thatching grass in Egypt and East Africa.

Secale cereale L. Said to be sometimes cultivated in Kenya solely for thatching. Straw of other cereals also may be used.

Hyparrhenia rufa (Nees) Stapf. In many parts of East Africa it is used for thatching and the stems for making fences.

Heteropogon contortus (L.) Beauv. and *Themeda* sp., common in Africa, and, used in other regions, may serve for thatching.

TOOL AND SKILL REQUIREMENTS

The tool requirements for using grasses in construction work are few consisting of an appropriate knife for cutting and trimming the grass and crude needles for sewing the bundles of thatch securely together. Most natives in areas where thatching is practiced possess such implements or could fashion them from materials at hand. For better types of thatching considerable skill may be required, although it could be and undoubtedly is done by the average native. Such skills are usually taken for granted among people who are accustomed to building their own houses.

There is little published data on methods and skills required, but the following extract from the Kenya (Africa) Labour Department Bulletin, Vol. 4 (1): 14-15. 1950, may be helpful.

"The pitch for thatch must be at least 45 degrees, i.e., the height of the ridge or apex must be at least half the span of the building.

Africans generally erect a central forked pole against which the rafters are piled from each upright. Circling battens are then tied or nailed on at 6 inch intervals. The central pole has been known to conduct lightening with disastrous results. This method is very extravagant on long rafters, as it is only necessary for 4 to meet at the apex.

In two methods, the roof is partly constructed on the ground and then lifted up on to the wall.

In one, a collar of withies, the diameter of the hut, is made. The four main rafters are fastened to this, at right angles to each other, the top ends being cut so that they meet neatly at the apex. A small collar is then fastened round just below the apex. Two feet below the apex, purlins (or cross pieces) are nailed to carry shorter rafters.

In the other method, two trusses with tie beams are build in one, at right angles to each other, and purlins are attached.

When the skeleton roof has been placed on top of the wall, the short rafters and jack rafters are attached. Each should be notched on the under side, to fit the corresponding upright, to which it should be fastened with a band of hoop iron. The circling battens are then nailed on and the lower ends of the rafters are sawn off to give a 2 feet eave.

The longer the grass the better. It should be cut after the seed has ripened but before it has dried out and become brittle. It must be combed to remove the soft leaf and short pieces and should then be dried. The grass should now be tied in bundles about the size of a double handful and the butts cut off square with a panga.

Convenient thatching needles can be made from 15 to 18 inch lengths of heavy gauge fencing wire. One end is filed to a rough point and the other is beaten flat so that a three-sixteenths inch hole can be drilled to form the eye. This is far superior to the wooden needle. Each thatcher should have three needles.

The first row of thatch should be butt downwards and the whole thatch can be carried out like this giving an external ridged appearance. Alternatively the bundles can be reversed after the first row giving a smooth finish.

Each bundle is fastened on to the purlin with a half hitch which should include half the previous bundle. The tie is then removed and the bundle beaten either with the hand or a piece of wood, so as to get the stitch really tight. Every 3 or 4 bundles the stitch should be properly knotted to prevent slipping.

One man is required on the ground to prepare and throw up the bundles, and one sticher on the roof is helped by an assistant sticher inside the roof.

The thatch should be at least six inches thick. When the ridge is reached, the last row is finished off butt downwards, the upper ends being sewn together.

The best natural thatching grasses are olengi and oat grass. Rye straw is also good and some farmers grow rye especially for thatching. Papyrus is also used, but it is put on thicker than grass and is twisted double round the purlins instead of being tied in bundles. Makuti is specially prepared on sticks.

There is a considerable passage of air through a thatched roof, which, while helping ventilation, is not sufficient to deal adequately with smoke from a fire in the hut. A pair of smoke vents can be let in to the roof 18 inches below the ridge. A half cone of basket work is constructed 18 inches long and 5 inches wide at the mouth or lower end. This is attached to the battens before thatching."

OBTAINING MORE DETAILED INFORMATION AND ASSISTANCE

Because of the apparent lack of information in literature, the best method for securing more data would be by means of field studies. As stated in the introduction, little attention has been given to the technical aspects of the use of grass in the construction of houses. It has been used mostly by primitive peoples or poorer classes, and the materials and methods more or less have been taken for granted. Since the materials and methods vary greatly from region to region, any housing project which is contemplated should be preceded by a thorough study in the particular locality. Every consideration should be given to the methods already employed before undertaking or proposing "improvements" as usually there is a definite reason for them. Studies should include interviews with local people who have constructed houses with such materials to determine what has been used and why. Errors not obvious at first may be avoided by doing so.

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