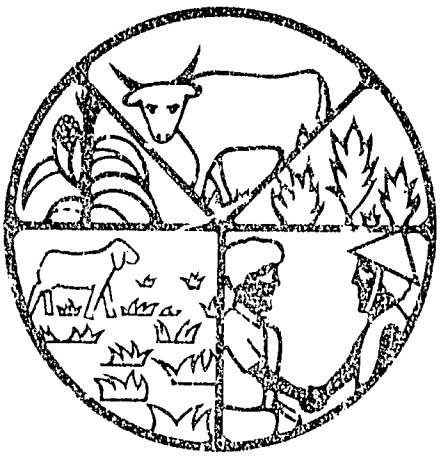
PN-AAU-757

Mixed Farming
Technical Report



GAMBIAN MIXED FARMING AND RESOURCE MANAGEMENT PROJECT

Ministry of Agriculture and
Natural Resources
Government of The Gambia

Consortium for International Development

Colorado State University

MAIZE CRIB DEMONSTRATION PROGRAM IN THE GAMBIA

by

William P. Spencer

Technical Report No. 18
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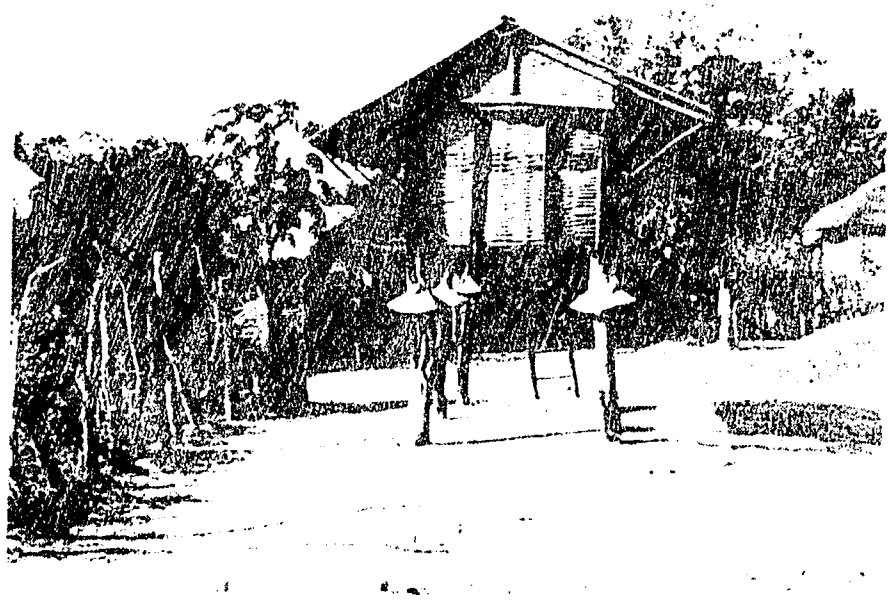
MAIZE CRIB DEMONSTRATION PROGRAM IN THE GAMBIA

Introduction

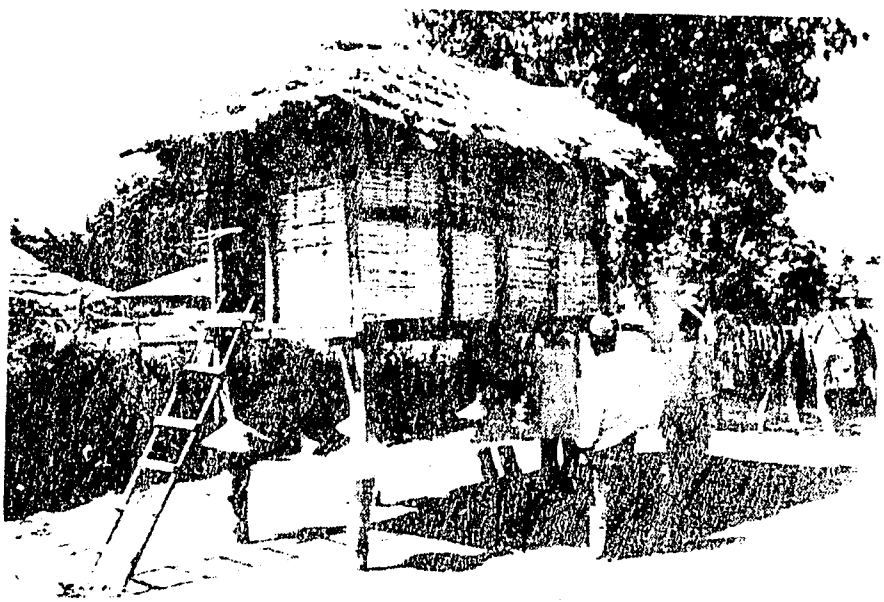
Maize production in The Gambia, West Africa increased at a very rapid rate in the early 1980s.[1] The large increase caused concern within the Mixed Farming Project (MFP) and the Ministry of Agriculture (MOA) that much of this needed increase in food grown in the villages could be lost if grain storage facilities were not expanded at the village level.[2] The MFP sought to demonstrate the feasibility of an improved, appropriate technology for reducing storage losses at the village level. The technology used was similar to that employed elsewhere in Africa but had not been used in The Gambia. This report describes the demonstration project used by MFP to acquaint farmers with this technology.



MFP Maize Crib With Rat Guards and Correguated Metal Roof

Background

Post harvest food losses have been estimated in The Gambia at 10 to 15 percent.[3] The storage loss problem in the Gambia is particularly pronounced because of high rodent losses. In other West African countries storage programs have reported similar losses. For example, A. D. Wilson reported in 1983 that stored grain losses in traditional Ghanian storage structures were 20 percent.[4] The MFP Marketing Economist estimated losses of stored grain in The Gambia in stored grain at 15 to 20 percent. We assume 20 percent below.



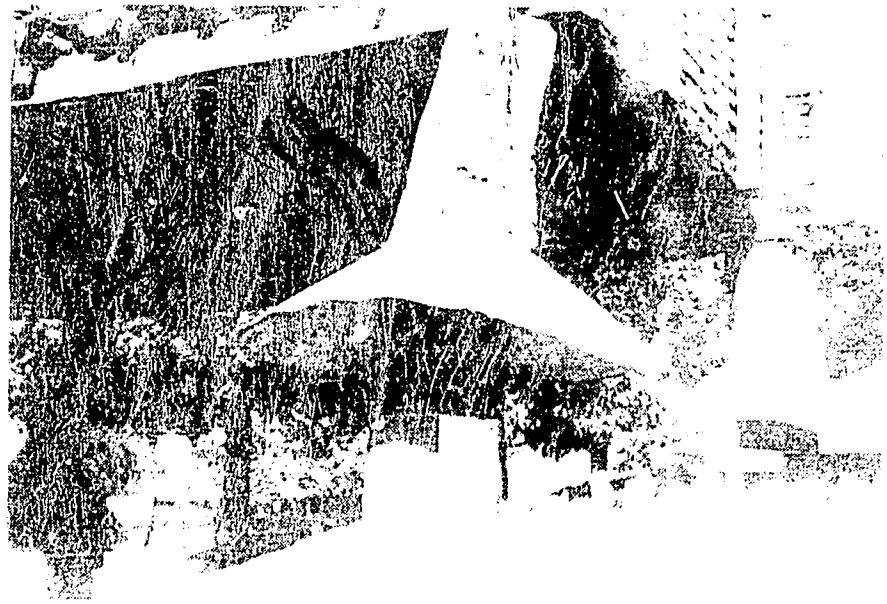
Completed Maize Crib on North Bank With Thatch Roof From Local Grasses

The demonstration was a joint project of the Crop Protection Service, and the MOA and MFP with the expressed goal of building a village level storage structure using local materials that would have a cost less than the value of storage losses that would occur in one year. An investigation of village level storage structures from neighboring Senegal and other West Africa

countries led to an adaptation of these structures to Gambian conditions. Much of the basic structure, size and design used in Gambia came from the crib designed by the FAO/Danida African Rural Storage Center, International Institute of Tropical Agriculture, Ibadan, Nigeria.

Methods

In the fall of 1985, the Mixed Farming Project initiated a grain storage construction program in selected villages throughout the country. Storage cribs were constructed using inexpensive, local materials and included a new feature to The Gambia: cone-shaped rat guards fitted to the posts which support the structure. These rat guards are located approximately one meter above the ground in order to stop larger rodents from jumping over the rat guard. (Refer to Appendix A for design of rat guard).



Rate Guard Located Approximately 3 Feet (1 Meter) Above Ground Level Constructed From Flattened Correguated Metal Scraps

The villages selected for the demonstration program included the integrated villages of the Mixed Farming Project of Boiram, Piniai, Njoben, and Choya. Peace Corps Volunteers (PCVs) working with the Mixed Farming Project were used as Extension workers in the construction of the storage structures and for that reason, the home villages of those volunteers were also selected. For the prototypes, all materials were furnished by the Mixed Farming Project. These included: corrugated metal roofing material, nails, as well as the traditional materials of hardwood posts to support the structures above the ground. Krinting (woven bamboo matting) was used for the drying floor, and walls and split rhum palm boards for the framing. Rhum palm is popularly used as a

Completed MFP Crib Being Used
To Store Seed Maize in Communal Storage

termite resistant building material in the Gambia. Material costs for the grain stores were just over $50, with the corrugated metal roofing material being the largest single outlay, at about $25 (See cost estimates on page 10).

Farmers who agreed to store maize in the structure the first year were given considerable freedom on how they used the crib. They could store seed or shelled grain or maize on the cob. They were told that after the first year, the crib could be used for any grain, in any way desired. All labor in constructing the grain stores was supplied by the farmer, his family, and his neighbors. Farmers were selected by the village council of elders and the Alkalo (headman) of the village. In four cases, women's societies were selected by the village council with the head of the women's society taking the leadership.

It was originally suggested that the farmer would use the maize crib to put his freshly harvested maize on the cob in the crib for drying purposes, thus freeing up his labor for harvesting other crops during the month of October. Experience showed that in many cases this was not done because the farmer preferred traditional methods of drying the grain in the sun, shelling it and storing the shelled grain in the maize crib. The women's societies, without exception, used the crib to store seed maize for the next year. Bags were tagged with the owner's name and put into the crib where periodic inspections were made by the Extension worker or the PCV to make sure the seed did not become infested with insects.

The cribs were fumigated by the Crop Protection Service before any grain was put into the crib. A three percent malathion spray was used for fumigation of the crib before harvest. The use of 120 grams of one percent malathion dust for each 200 kilograms of grain was recommended. Later it was discovered that the Crop Protection Service was unable to obtain the malathion dust and this part of the test was not completed.

The Maize Crib

The crib is designed to have a floor not less than three feet (90 cm) and not more than four feet (122 cm) above the ground. Because of the large rodents in The Gambia, the maximum level of four feet is suggested. However, if it is more than four feet, the crib becomes difficult to load. Overall height of the crib should not be above ten feet (305 cm) from ground to top of roof. If higher than this, it would again be difficult to load and could become unstable.

Save-the-Children Village Storage Demonstration
on North Bank Using All Local Materials

Various Stages in Constructing a Save-the Children Village Storage Crib on the North Bank Using all Local Materials

The width of the crib should not exceed five feet (150 cm). Drying is dependent on easy passage of air and if the crib exceeds five feet in width, drying in the center is impeded.

The crib can be made to any length depending on the needs of the compound. If possible, the crib should be aligned with stronger prevailing wind blowing across the crib at a right angle. Grain drying is enhanced by increased air flow through the width of the crib.

The roof should be made to overhang the sides of the crib on all sides by one foot (30 cm) and the ridge should be at least one foot higher than the sides to allow good drainage of water from the roof.

A crib four feet (122 cm) wide, filled five feet six inches (175 cm) deep will hold three tons of maize on the cob for every six feet (180 cm) of length. With this amount of weight strong support posts must be used in construction of the crib. Care should be taken to set the posts supporting the crib at least two feet (60 cm) in the ground.

Table 1. Cost of Prototype Crib*

Wood Frame	Cost U.S.$
Local wood poles 3-5 inches (7-13 cm) in diameter	
(10) 9 feet (300 cm) main support poles	8.00
(8) 6 feet (200 cm) for floor	4.00
(10) 4 feet (120 cm) cross poles for sides	4.00
(5) 6 feet (200 cm) for roof	3.00
Nails	
2-1/2 pounds (1 kg) of 2-1/2 inch (6 cm) nails	3.00
Roof	
8 standard 6 foot (180 cm) length of corrugated metal sheeting	24.00
Sides	
5 sheets of local woven bamboo matting (krinting)	10.00
Oil	
Treatment of poles (old engine oil)	.50
Total Cost of Materials	$56.50

* Four feet (120 cm) wide x six feet (180 cm) long x six feet (180 cm) high.

Savings

The savings of 15 percent (one half of the loss) from three tons of maize on the cob (or the equivalent two tons of shelled maize) is 300 kilograms of grain. The 1985 price of shelled maize was about 250 U.S. dollars per metric ton. An estimated savings of about 75 U.S. dollars per year more than offsets the entire cost of materials of the prototype crib. By using alternative materials for the roof (thatch) the cost of materials can be lowered by the local price of the corrugated metal sheeting.

Maize crib construction time varied from three days to three weeks depending on the skill and number of workers as well as the availability of the construction materials. The best results

were achieved when a team of four village workers known to be good carpenters were transported to a prototype crib to observe its style and size and then returned to the village to construct the crib under the supervision of a Peace Corps worker. In that case, materials were readily on hand and construction was completed in three days.

Follow up

Follow-up inspection of the grain stores at the end of the 1985 storage season found that farmers were experiencing only small (2 to 5 percent) insect losses and had received no rodent loss.[5]

Since the initial ten prototypes, several additional grain stores have been constructed by individuals using only local materials. The best example is the one built by a women's society in Kassagene under the supervision of the Peace Corps Volunteer residing in Jorembunda. The Save the Children campaign has also adopted the structure as one of their prototypes for future construction.

Issues

The Crop Protection Service would like to be involved in a grain storage project to reduce on-farm, stored grain losses. However, funding prohibits them from an Extension program on this. Any program of this type should be coordinated with the Ministry of Agriculture as well as the PPMU for educational programs concerning seasonal movements of grain prices and the advantages of using the grain stores as tools in marketing grain throughout the year. Additionally, a national program could reduce losses due to rodent, insect and bird damage and increase grain supplies 10 to 20 percent. Small demonstration programs such as the Mixed Farming Project's prototype structures will

encourage some additional structures to be constructed but the impact will be minimal unless there is a national program coordinated between agencies.

Footnotes

1. 1980-81 maize production was 6.6 thousand metric tons. 1982-83 production increased to 17 thousand metric tons with an average annual growth of 15.7 percent between 1978-79 and 1982-83.

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3 Food and Agricultural Organization (FAO) of the United Nations, 1984. The Coarse Grain Industry of The Gambia, Vol. 2, Technical Annex, Rome.

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5. Kalamanlie Juwara, 1985. "Assessment of the Utilization of Grain Stores by Farmers," Mixed Farming Field Report, Banjul.

Appendix A. Dimensions of Rat Guard to be Cut from Flattened Corrugated Sheet Metal.

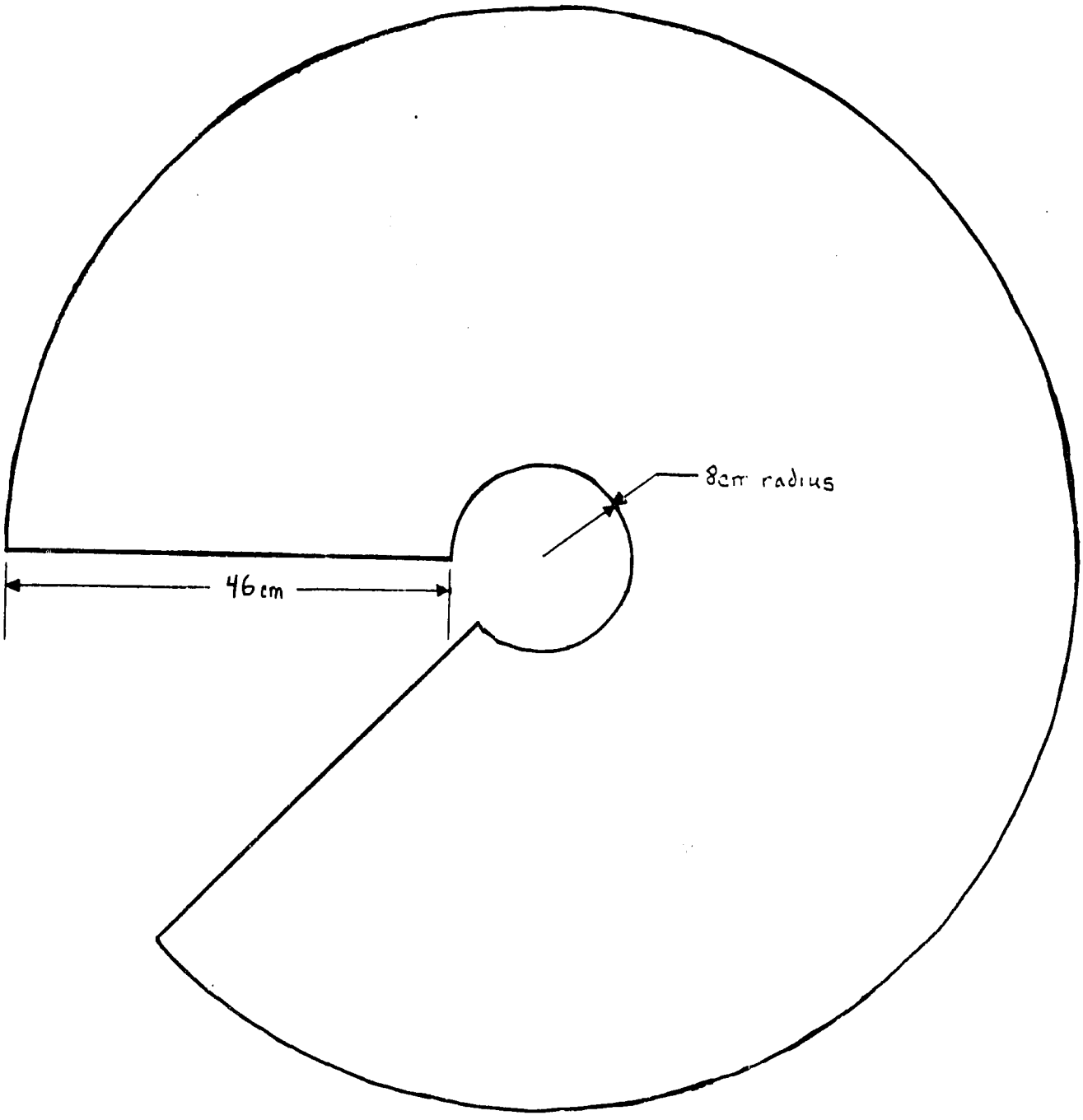

Diagram of Corn Crib Rat Guard