DISSEMINATION OF ADOBE TECHNOLOGY IN A HOUSING RECONSTRUCTION PROGRAM

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SUMMARY

This paper describes a housing reconstruction program in northern Peru after the 1983 floods due to "El Niño" phenomenon. The objective of this program was to implement and disseminate improved adobe construction technologies through instruction, training and technical assistance in rural communities that were relocated after the floods.

This project was carried out as the field dissemination part of the Research Project "Preservation of Adobe Constructions in Seismic and Rainy Areas", developed by the Catholic University of Peru (PUCP) from June 1984 to May 1985.

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1. INTRODUCTION

The problem of rural housing has not been seriously studied nor discussed at government level in Peru, thus existing a lack of experience in this field. Although population and housing censuses give us some data on the conditions of housing in rural areas and some information is available regarding the housing typology, this information is usually not enough to determine the real needs, nor the possibilities to improve the housing quality in such areas.

The rural housing is usually the most vulnerable against natural hazards and interesting and helpful mitigation actions have emerged in housing reconstruction when rural communities have been affected by natural disasters (earthquakes, floods, etc.). The experience obtained in these isolated actions have to be rescued in order to make possible an effective and permanent action.

2. BACKGROUND

In order to understand the characteristics of the program, it is necessary to make a description of the most relevant previous facts which had some influence in its definition. It could be said that this program is a pilot effort in the application of an improved technology, as a rehabilitation action in an area affected by a natural disaster.

2.1 Description of the Natural Disaster

Between November 1982 and June 1983, six months of heavy rainfall caused the most dramatic series of flooding of this century over the coastland of northern Peru. The rain was caused by the "El Niño" phenomenon, one of the most spectacular events of the ocean and the atmosphere which produces a great impact in the climate and marine ecosystem.

In the north of Peru from Tumbes to Lambayeque, rainfall was the most heavy registered to that date, approximately 30 times greater than the average.

The damage caused by "El Niño" was very extensive, affecting approximately 1,200 km of the coastal area, from Tumbes to Lima, and specially the Departments of Tumbes, Piura and Lambayeque. The total losses were estimated in US$ 1,250 million, mainly in agriculture, highways, bridges and industrial installations. At least 100 persons died and thousands lost their houses.

Most of the damage in housing occurred in rural adobe houses whose roofs were unprepared for heavy rains and because of flash floods in towns near the river banks.

2.2 The Reconstruction Process

The interest of the Government after the disaster centered in the reconstruction of highways, the rehabilitation of the agriculture, and the rehabilitation of the basic water and sewage services in the cities. No specific program was established on housing reconstruction.

In order to apply the different reconstruction programs in the areas affected by the natural disaster, Reconstruction and Rehabilitation Offices were created by the Development Corporations of Piura (CORDE-PIURA) and Lambayeque (CORDELAM). The task of promoting housing reconstruction was commissioned to credit institutions, such as the Housing Bank and the Bank of Materials. But in this case, the majority of the persons who lost their houses belong to the low income strata and do not have access to formal credit. However, international institutions such as the Agency for International Development (AID), supported programs destined to the relocation of towns and reconstruction of houses, which in part filled the lack of help to the low-income strata. In exchange, certain State participation was required, thus involving Rehabilitation and Reconstruction Offices in housing programs.

Additionally, labor hand was required from the people participating in those programs.

The general criteria for housing rehabilitation was to relocate the towns on land safe from river floods.

AID supported financially the primary habilitations of lots in several affected towns in the Department of Piura and Lambayeque. It consisted on the levelling of the land the designing of blocks and lots, basic street paving and basic supply of water, after which the relocated people would be able to start the construction of their houses.

In the Department of Lambayeque, CORDELAM made the technical study to relocate three affected towns: Lagunas, Tupac Amaru and Chochope. The first one because was left isolated by the Zaña river and the last two because were flooded.

During the emergency stage and while the primary lot habilitation work was performed, the affected people built temporary shelter using canes, plastic sheets and cardboards, some of them in higher areas and others close to farming areas, also some people abandoned the area and moved to other towns or cities. This situation lasted one year until the beginning of 1984 when people started to move to the new location.

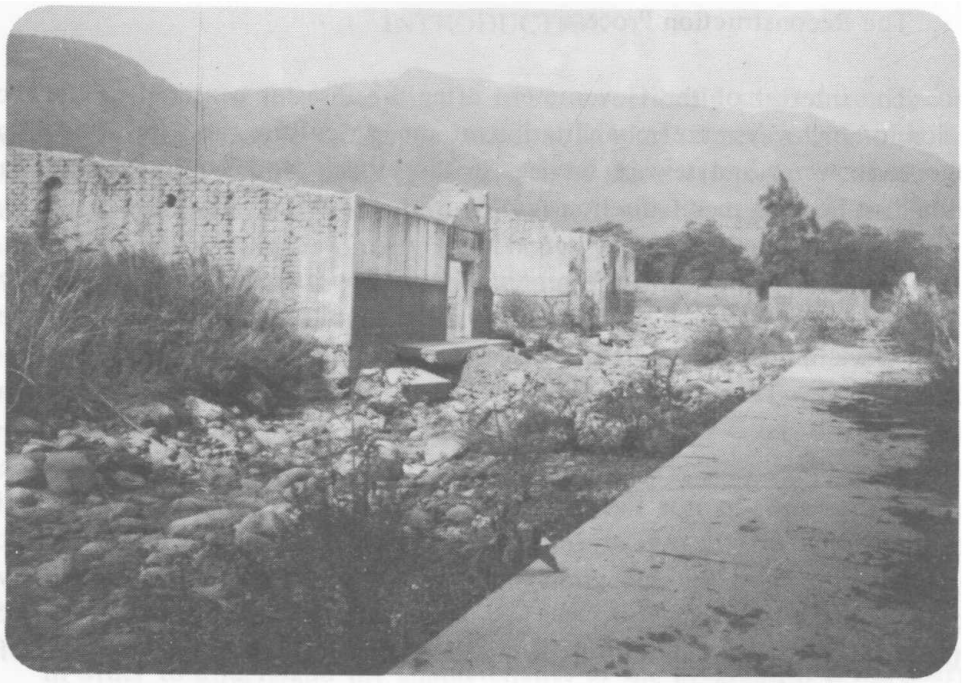

Fig. 1 Damage caused by the floods in the town of Chochope.

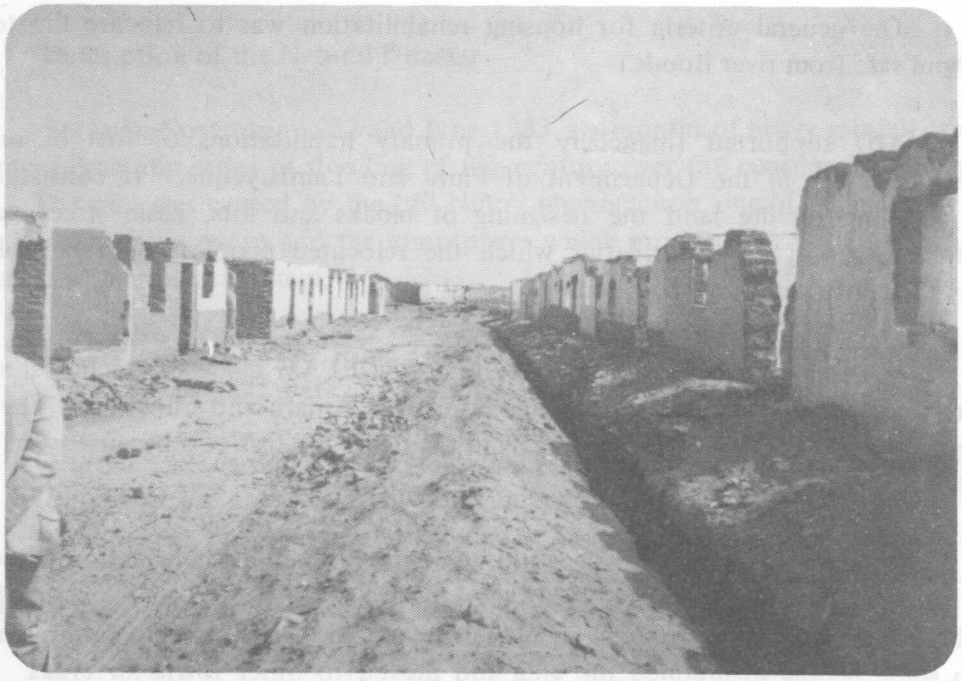

Fig. 2 The town of Lagunas abandoned after being isolated by the Zaña river.

The Lagunas case was unique as the people remained in the isolated town until they were massively relocated at Canasloche, some 7 Km from Lagunas.

At the end of the relocation process, CORDELAM channeled new funds from AID for the purchase of construction materials. This aid was given to the three towns mentioned, demanding in exchange that the beneficiaries participate with their work in the construction, and that they follow the recommendations on improved adobe constructions.

2.3 The Technological Innovations in Adobe Construction

The Catholic University of Peru has studied, through several research projects in the last twelve years the way to improve the seismic resistance of the adobe houses, from which practical recommendations have been obtained for their application in the field. The most important recommendations are referred to the inclusion of a mesh of cane inside the adobe walls and the addition of straw and coarse sand to the mud used as a mortar.

Other recommendations refer to the use of a concrete foundation and a wood collar beam attached to the vertical canes and the roof wood beams. The objective is to provide additional strength and to avoid the sudden collapse which is the main cause of human losses during earthquakes in this type of constructions.

Additionally, an improved method of manual fabrication of adobes was recommended which gives a more resistant adobe unit. It mainly consists on the use of a mold with botton part instead of the bottomless mold traditionally used.

3. PROGRAM OBJECTIVES

The program had as its basic objective the study of the application in the field of the model with improved adobe construction. There was a need for knowing if the model developed in the laboratory which had been successful to endure seismic actions, could be reproduced in the field this time constructed by the users and workers, following traditional building systems.

In order to accomplish the objectives, it was necessary to identify institutions to work with on specific reconstruction programs, and the following work plan was elaborated to be implemented in such program.

1. Preliminary visit.
2. Survey-study of the housing conditions of a specific location
3. Study of the possibility of constructing new houses in that location.
4. Formulating a specific work plan.