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by

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INTRODUCTION

The housing shortage in Venezuela is partly due to the underdevelopment of the country and partly due to the lack of an appropriate national policy.

The main factors affecting the housing shortage are:

1. There exists an incompatibility between housing costs and per capita income.
2. The housing construction industry is poorly organized.
3. The absence of appropriate legislation.
4. There are not enough stimuli for private initiative.
5. The lack of due consideration to the problem in the preparation of the National Budget.

The incompatibility between housing costs and per capita income plays an important role in the selection, among many alternatives, of a solution to the housing shortages. The magnitude of the problem in Venezuela is clearly shown in Table 1.

TABLE 1: COMPARISON OF FAMILY INCOME RANGE TO HOUSING SHORTAGE

Family income $ per month	Total number of families %	Housing shortage %
more than $ 680.00	10.2	1.0
$ 343.00 - $ 680.00	19.1	6.1
$ 227.00 - $ 342.00	17.1	11.3
$ 114.00 - $ 226.00	30.5	36.9
$ 68.00 - $ 113.00	12.4	22.2
less than $ 67.00	10.7	22.5

Table 1 shows that 23% of the families have an income of less than $100.00 per month and the housing shortage covers 45% of this group. Thus, the families with the lowest income have the greatest need for appropriate housing.

These families live today in unsanitary "ranchos" which have created social and political problems due to poor living conditions, promiscuity and lack of family stability.

The solution must have as its objective the substitution of the "ranchos" by housing units that fulfill the minimum requirements for healthy habitats, at a cost not higher than the "rancho" and that construction and financing of these units be made with the full cooperation of the participating families.

The problem of the housing shortage is very acute in Caracas, the city with the highest population - about one-third of the total - and a very high growth rate. The valley of Caracas has a very small and narrow floor area and therefore the flat land is at a premium. Families with the lowest incomes are forced to live on the steep hills that surround the Caracas valley. Fig. 1 shows an example of the "ranchos" on the hills adjacent to the city.

The "rancho" constitutes a social and sanitary hazard and a danger to the lives of its inhabitants because it collapses whenever strong rains produce frequent sliding of the saturated residual soils of the hills.

The Banco Obrero, a government agency, was instructed to search for solutions suitable for immediate application to the problem of the "rancho" in Caracas.

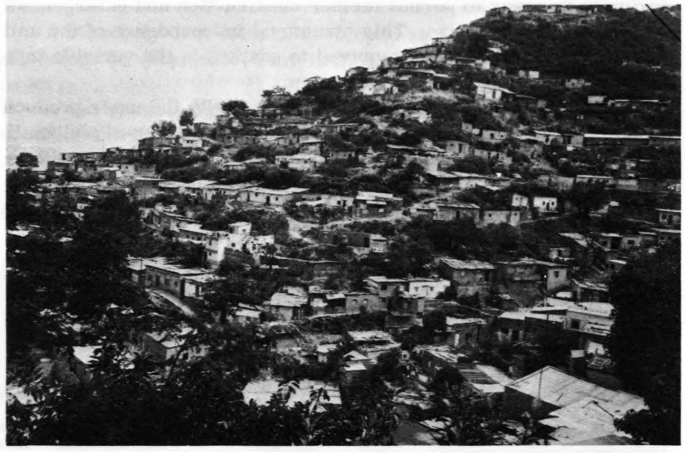

Fig. 1. The Problem of the "Rancho" in Caracas

A SOLUTION

The national housing problem will definitely be solved with the development of the economical, educational, social and human resources of the country. However, the families living in the rancho are in urgent need of a solution suitable for immediate application. The proposed solution should consider the full utilization of the human and financial resources available to these families. The final result should provide an environment that will stimulate a desire for a higher educational and economic level.

With these limitations in mind, several solutions were studied, and from these the Banco Obrero selected the construction of housing units on the steep slopes -- about 1/2 : 1 -- on an experimental basis. It was considered feasible to construct housing units on the hills adjacent to the city with slopes not greater than 1/2 (horizontal) to 1 (vertical), minimizing the amount of earth removal and with the use of construction methods of easy execution that could take advantage of the unskilled labor available in the area.

CONSTRUCTION METHOD

The steep slopes of the hills are cut in series of successive vertical berms -- 2 mt. high and 3.40 mt. wide -- as shown by Figure 2. The construction of the berms should avoid excessive removal of soil and, if possible, the stripping of the topsoil. Removing large quantities of soil will increase the cost of construction considerably.

Fig. 2. Construction of the Berms

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The system of construction of the housing units consisted of the use of bearing walls with concrete slabs (2.5" thick) with wire reinforcement supported by steel beams. This method of construction is well known by the unskilled labor in the area, as the people who live in the "rancho" have used it to strengthen and enlarge their "ranchos".

Each housing unit is constructed independently of its neighbouring units in order to permit further construction and enlargement of the unit in the future. This structural independence of the unit also allows the flexibility required to adapt it to the variable topography encountered in its construction.

There has been some experimentation with the mass production of this type of unit. A sliding metal framework is used which allows the construction of a unit per day per set of metal framework.

Fig. 3 shows the construction of several of the housing units in the area called "Brisas del Paraiso".

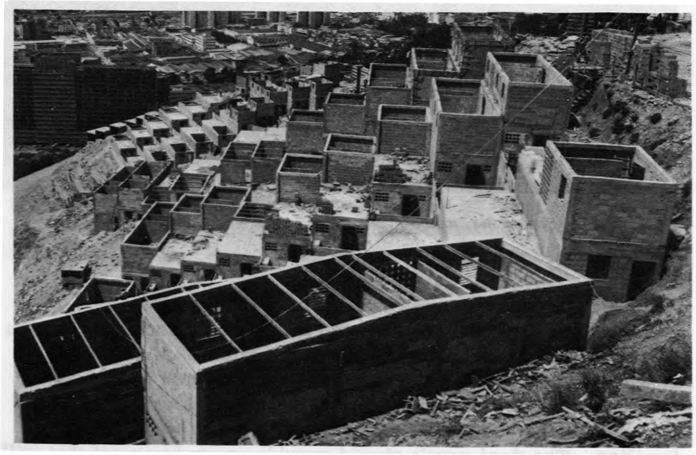

Fig. 3. Construction of the Housing Unit

THE HOUSING UNIT

The unit occupies a lot with an area of 48 square meters. It is built in stages to minimize the cost to the family and to the government and to allow further improvement of the unit by the owner.

The Banco Obrero provides the engineering know-how in the construction of the berms plus the construction of a sanitary unit that consists of bathroom and laundry room. This first stage allows the owner to have a starting point for further construction of the unit on his own. The result of the second stage is a unit with 38 square meters and capacity for a family of 6 to 9 persons. It provides separate sleeping facilities for parents and children. The children are separated by sex, with the use of bunkbeds.

This unit has the foundations required to support a second floor which adds up to a total area of 76 square meters. The construction of the second floor constitutes the third stage, and the owner decides whether or not he needs it.

Fig. 4 shows a photograph of a finished group of the units.

Drinkable water, electricity and sewage disposal facilities are constructed under the supervision of engineers employed by the Banco Obrero. Other facilities such as schools, nurseries, communications and sport areas are also designed and constructed under the supervision of Banco Obrero personnel.

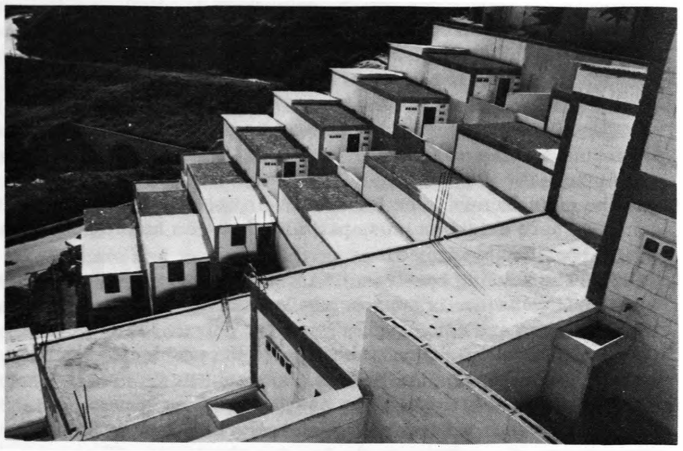

Fig. 4. Completed Group of Housing Units

GEOLOGICAL CONSIDERATIONS

These experimental housing units are constructed on hills at the southwest corner of the valley. These hills belong geologically to the formation "Las Brisas". The bedrock consists of a mica-schist with quartz layers parallel to the foliation. The mica-schist is covered by a layer of residual soil of variable thickness (up to 1.50 mt. thick) which is saturated in some areas.

The saturated residual soil and the topsoil may constitute a foundation stability problem. However, the combination of factors such as economy, simplicity of construction and the low loads transmitted to the soil by the bearing walls, allow the construction of the foundation on the topsoil in most cases. In some instances, the topsoil is removed under the responsibility of the supervisor on the job.

The installation of sewage disposal facilities and the collection of rain water will materially improve the stability of these slopes and minimize the rock-weathering problem.

CONCLUSIONS

Although the project is on an experimental basis, the following conclusions may be drawn:

1. Construction of the housing units on slopes 1/2 : 1 is feasible.
2. There have not been any stability problems in spite of rains of long duration.
3. The people of the "rancho" have accepted the proposed solution with enthusiasm.
4. The cost to the family is $12.00 per month.

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