

Technologies for environment-sustainable construction in the Cuban agricultural-stockbreeding system

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Towards the end of the Seventies, the province of Havana (Cuba) was affected by a major influx of immigrants from the eastern regions of the island. New communities without infrastructures, services and with unhealthy dwellings such as Macondo (1) were constructed illegally in the rural areas. Today, the Government plans to gradually eliminate this village in order to transfer the population to new housing constructed for the nearby community of Las Mercedes. The thesis addresses the design of low cost housing with minimum environmental impact able to improve the living conditions, health and comfort of these persons.



1. Macondo dwelling

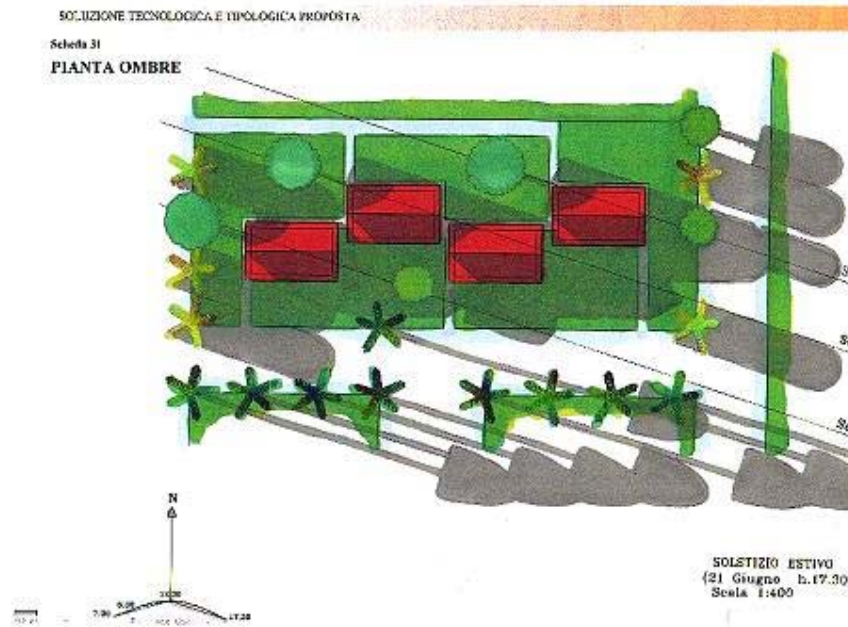
The proposal defined is the result of research carried out in three phases:

- The **first** was carried out in Italy and is based on collection of information from biographical sources and the Internet;
- the **second**, at Cuba, made it possible to identify and study the area of operation (Macondo and Las Mercedes) and to verify the information obtained previously (by means of a direct survey, interviews, documentation of Cuban libraries and research centers);
- the **third**, once again in Italy comprised reprocessing of the data collected in order to define the general outline of the situation in Cuba, building regulations, evolution of the types of houses, availability of construction technologies and materials.

An analysis was also made of the soil of Las Mercedes in order to assess the possibility of using this as construction material and the technologies and the plants to be installed in the house were selected.

A good knowledge of the general characteristics of the island and of the specific area involved promotes correct design of low-cost, environment-sustainable solutions:

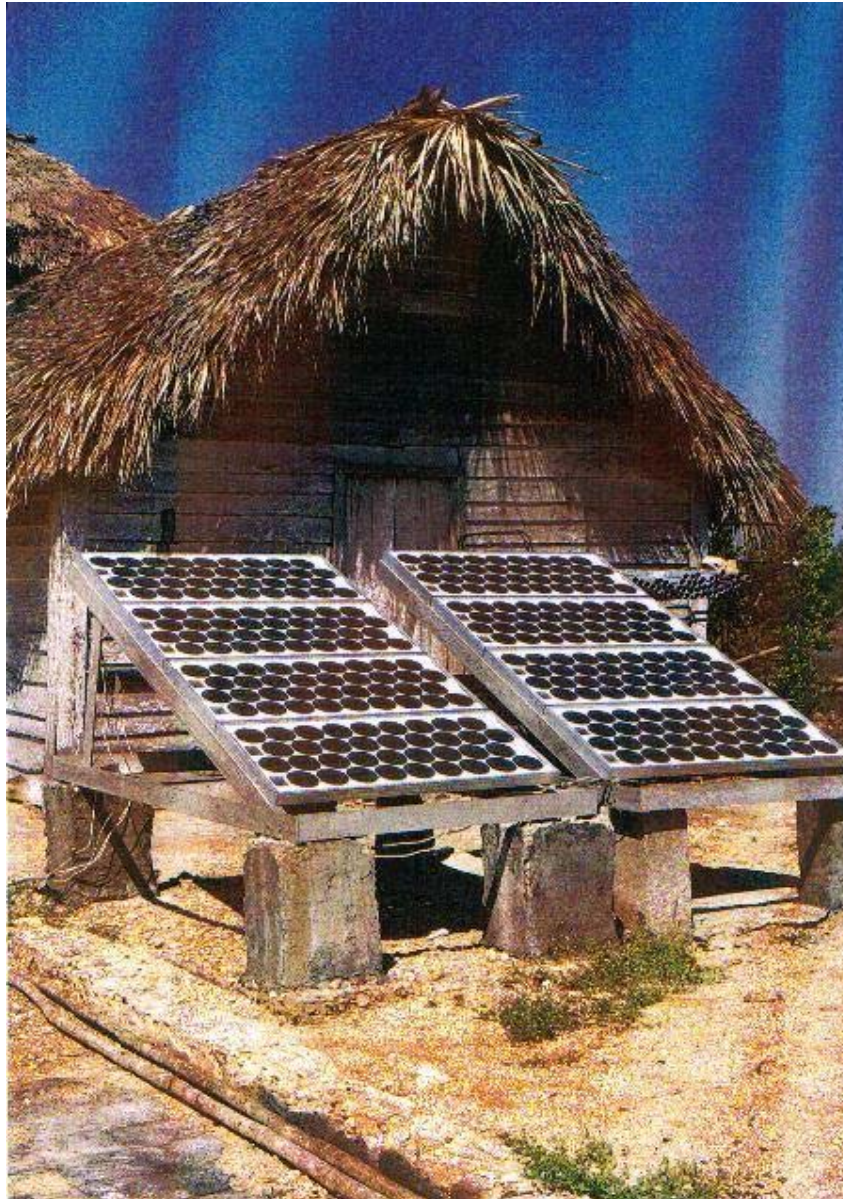
1. **Analyzing evolution of Cuban housing** made it possible to establish the types of houses and the most suitable materials according to climatic conditions and the needs of the population (such as *bohio* or the colonial houses instead of prefabricated systems).
2. **The analysis of the current economic**, political and social situation of the country and of the characteristics of the area involved (availability of resources, climatic and environmental conditions) made it possible to define the limits and most suitable design strategies.
3. **The technologies adopted** at Las Mercedes (for the foundations, ceilings and roofs) were studied in order to identify those most suitable for the climatic conditions and requirements of the local population and to apply these to the building proposed with the auto-construction technique.
4. **The tests on the soil** in the area made it possible to define its characteristics and to establish the advisability of using it to construct the walls. The most suitable technique was identified comparing the energy consumption of the various methods used to produce the block of soil (simply compressed, stabilized or baked) and the characteristics of the product obtained.
5. **Environmental design** made it possible to define the shape and dimensions of a housing model suitable for the climatic and environmental characteristics of Las Mercedes. The best solution for orientation, internal division, distribution of the buildings and the surrounding vegetation was then established. With an attentive analysis (2), it is possible to check the contributions of heat around the dwelling and to restrict use of electrical appliances powered by conventional sources of energy. Correct distribution of the apertures promotes natural, cross ventilation which is important in areas with a hot damp climate.



2. Shadows

study

6. The possibility of using **plants** for the supply of electricity (3), gas and water that exploit renewable sources of energy and involve low production, installation, operation and maintenance costs was also considered. Insertion of a system for the use of waste and storm water has also been envisaged.



3. Photo-voltaic system

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