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Hemp for rural building construction

A tool for sustainable development in the Colombian post-conflict scenario

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Synopsis

In Colombia, rural communities often face transportation difficulties, unemployment and precarious housing situations aggravated by their isolated condition. This work aims to analyse how architecture can contribute in changing agricultural economy. The research focuses on the application of architecture as a strategy for sustainable rural development through the cultivation of hemp for the production of building components. In order to assess this possibility, a hemp-based prototype house was design for the providence of Toribío, one of the poorest areas in the country and also one of the most important marijuana's production centres in Colombia. This project could be replicable in other rural areas and could contribute to build sustainable multi-functional landscapes able to improve local economies and entrepreneurial capacities of their communitiest.

Key words: Hemp, building components, sustainability, rural development.

1. Colombia: Background

Despite having one of the richest bio-diversities on the planet, in Colombia poverty continues to be a big problem. In fact, 27,8% of Colombian population lives in poverty, and this rate increases to 40,3% in rural areas, making it one of the most unequal countries in the world¹.

In many ways, this problem is linked to the 50-year internal conflict between the Colombian State and the guerrilla groups, which is estimated to have displaced more than 5.7 million people from their homes and lands², affecting mostly the rural population. This situation has been aggravated in recent decades by the expansion of drug trafficking: opium, marijuana and cocaine.

2. Goal of the study

Considering that the final Peace Agreement between the Colombian government and the main guerrilla group (Revolutionary Armed Forces of Colombia -FARC) signed in 2016, has placed substitution of illegal crops as one of its main objectives to fight drug trafficking and to strengthen rural economy, the goal of this research was to investigate the possibility of replacing marijuana for hemp cultivations, in order to create a new production chain of hemp-based building elements. A prototype house using existing products was design in order to establish the quantity of hemp required to build it.

3. Study area

The study area was located in a rural area of the Colombian Pacific region, in the province of Toribío at north of Cauca department (Fig. 1). This area was chosen not only because of the environmental features that make it particularly suitable for the cultivation of hemp, but also because is one of the most vulnerable areas in the country. Since adaptive capacity and resilience depend mostly on access to financial, material and social resources³, the realization of this project could contribute to build a sustainable development model for its community.

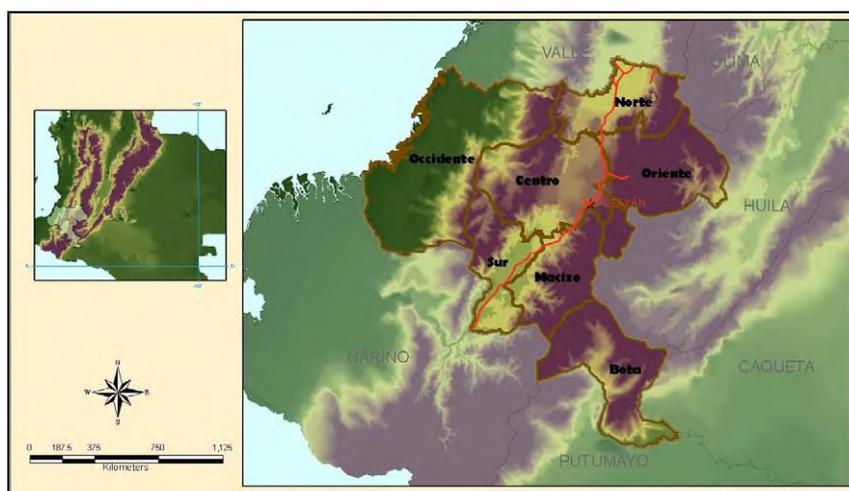


Figure 1.

¹ IFAD, 2016.

² Ibidem.

³ NCCARF, 2015.

2. Methodology

For this study, the following analyses were carried out:

- identification of the main properties of hemp and the benefits it brings as a cultivation and as building material;
- identification of the different types of hemp-based construction products already on the market;
- checking the current availability of marijuana's cultivations in Toribío to verify the real possibility of replacing them and use locally grown hemp to manufacture building components for rural housing;
- characterization of rural residents and housing based on socio-cultural and environmental aspects.

These analyses were then used for the definition of a matrix, which correlated requirements and design strategies and was useful for the prototype house design.

3. Hemp as an alternative crop

Currently in Colombia there are no hemp cultivations. However, there are many areas where marijuana is cultivated illegally. For instance, according to unofficial data, in 2015 there were approximately 215 hectares of Cannabis plantations around Toribío⁴.

However, with the law N°1787 of 2016, Colombia became the fourth Latin-American country to have a legislation for scientific use of Cannabis. Since then, some projects have been developed for the legal use of marijuana. Caucannabis and Walacannabis are two examples of cooperatives located in the area of Toribío that use marijuana seeds and fibres as raw materials for food, cosmetics and natural medicine products.

Considering that marijuana and hemp are Cannabis sativa subspecies⁵, the proposal to use hemp in building construction could expand the current Colombian political framework, becoming an alternative solution for the post-conflict agreement's key points that promote substitution of illicit crops and implementation of comprehensive rural reforms⁶.

4. The prototype house

For the design of the prototype house (Fig. 2), two basic criteria were taken into consideration:

- Relationship between housing and environment.
- Traditional architectural features of local rural housing.

⁴ Noticias RCN, 2015.

⁵ Johnson, 2015.

⁶ OACP, 2016.

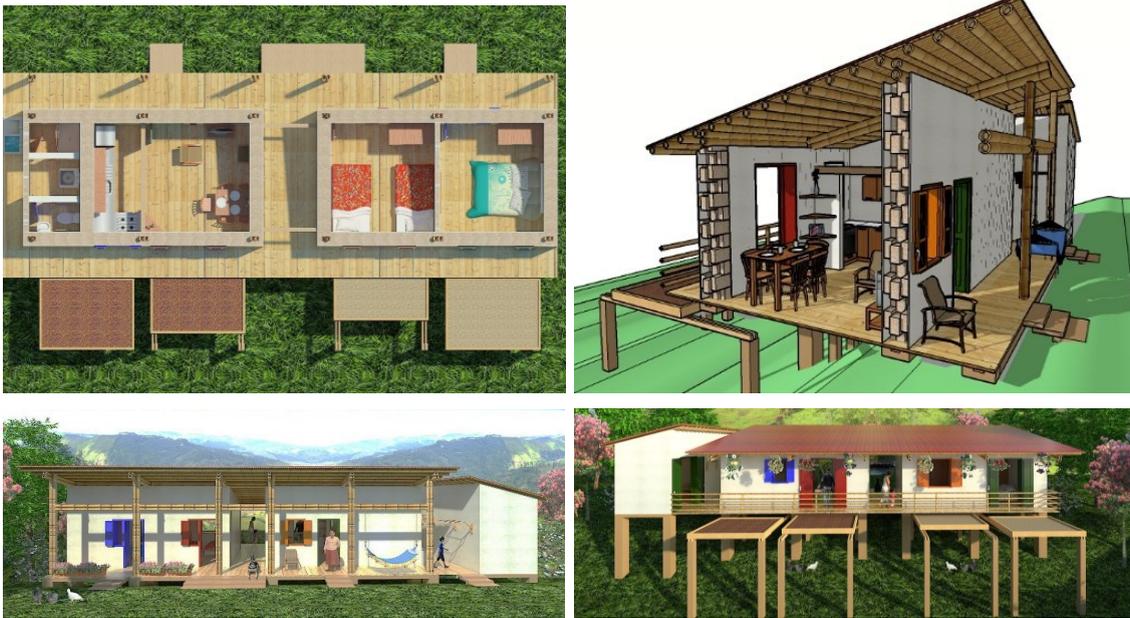


Figure 2.

The house used a construction system based on an existing product called Blick 38 (Fig. 3), a prefabricated hemp-lime block produced by Banca della Calce (Italy). The idea was that components such as this one could be produced in Colombia using local products and skills. Due to the easy-growing characteristic of hemp and the cold process used for the production of hemp-based blocks, this method could be an excellent solution for rural areas where economic and environmental costs of conventional construction solutions such as concrete or steel, often increase due to the difficulties of transportation and the need to employ skilled workers.



Figure 3.

This project could be included in the new provisions for the National Plan for Construction and Improvement of Rural Social Housing signed by the Ministry of Agriculture and Rural Development in 2017, that grants subsidies to rural vulnerable communities.

5. Results and conclusions

According to research data⁷, the characteristics of the prototype house and the amount of hemp required to build it (Fig. 4), it was determined that with the amount of hemp grown in the study area, Toribío's community can build more than 70 houses annually.

Floor area	59m ²
Walls area	146m ²
Hemp shives total amount required	12860kg
1-hectare hemp = 4425kg hemp shives	
2,9hectares hemp = 1-prototype house	
215/2,9hectares = 74 houses	

Figure 4.

A new commodity chain based on hemp for rural building construction not only can improve the living conditions of the population (e.g. home comfort), but also can provide direct employment for many rural, unskilled people, (both in plantation and in processing facilities) contributing to build sustainable multi-functional landscapes and a new agricultural economy model (Fig. 5).

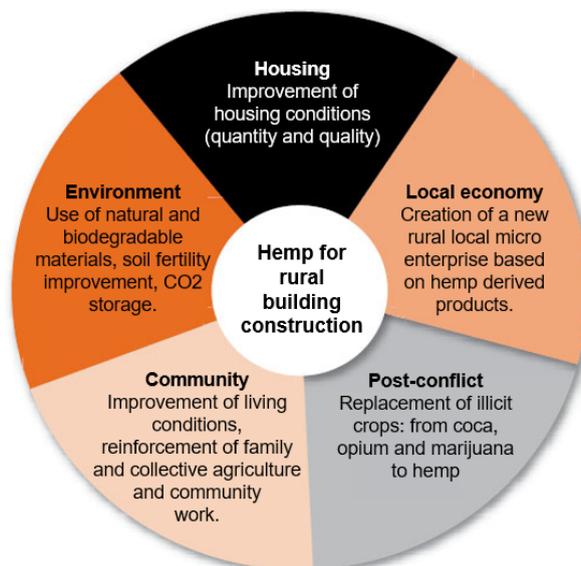


Figure 5.

Furthermore, although this study was based on a specific study area, the application of an alternative development project such as this one, in other rural regions can contribute to maintain successful results in the fight against illicit cultivations in the Colombian post-conflict scenario.

⁷ BRE, 2002.

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Biography

Mónica Alexandra Muñoz Veloza. Colombian architect and researcher in Architectural Technology at the Department of Architecture and Design (Politecnico di Torino). In 2014, after having obtained the title of Architect at the *Universidad Nacional de Colombia* in Bogotá, she started her Master Degree in “Architecture for the Sustainable Design” at the Politecnico di Torino, graduating in 2017 with the thesis entitled “The use of hemp in building components for the development of a modular house in Colombia”. She has worked in several architectural firms both in Italy and Colombia and has collaborated in historical research of the Colombian territory. Currently, she conducts her research with the project “SUPER: Super Use of Products for Ecological Reclaims. Super use of agricultural, industrial and building wastes to designing and manufacturing materials and components”. She’s also part of an international team that will compete in the Solar Decathlon Latin America & Caribbean 2019.