

AGRICULTURE WASTE PRODUCTS AS RESOURCES FOR BUILDING LOW TECH DESIGN

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Summary

In Abruzzo Italian Region, after earthquake, it's possible to wish in a sustainable development for the future of *sensitive areas* using low tech material from the territory for building. Agriculture waste of cereal productions, very developed in those areas, can be used as material for low tech proposals building. In particular the use of straw in construction has been limited, until now, to those dedicated enough to acquire the skills and knowledge to build their own properties, in self construction. Now, in a critical situation of emergency, we have the chance to use this material in a commercial construction industry, born in the territory.

The concept takes a material perceived as refuse and combines it with modern methods of construction, for consider it a resource and recreate an economic system, developing a sustainable, carbon-neutral cladding system.

Keywords: industrial ecology, refuse-resource, low-tech, straw bale system, local production

1 Introduction

The L'Aquila territory economy hard put to start again, struck by earthquake of the 6th of April 2009. As a result of future reconstruction of whole villages, building construction sector will have hard impulse in next year. In order to make economy starts up again we intend to develop a *chain* for building material production through use of local resources or rejects, closing product lifecycles of existing economic activity in the perspective of the creation of an industrial ecology district.

2 Territorial Analysis

2.1 Navelli's plateau territory

2.1.1 Territorial potentiality

The Navelli plateau territory is composed from five villages in a radius of 8 km: Barisciano, Caporciano, Navelli, Prata D'Ansionia, San Pio delle Camere.

This distance among them be able to set up common activities and to approach to energetic self sufficiency, creating an industrial ecology center as best practice rejoining not only in Abruzzo Region. The Navelli plain with own cereal activity, the sheep

breeding, and the forest resources to put in system, allow to hypothesize industrial symbiosis for join already activities to a new low tech industry.

2.1.2 Localization

Industrial symbiosis will be set up in order to interact with all neighboring villages, for closing cycles also with anthropic system.

In this area there are already industrial activity that could be minimize in emission, refuse and impact, putting them in system with new activity: wood chain for production of structural frame and straw bale production for building.

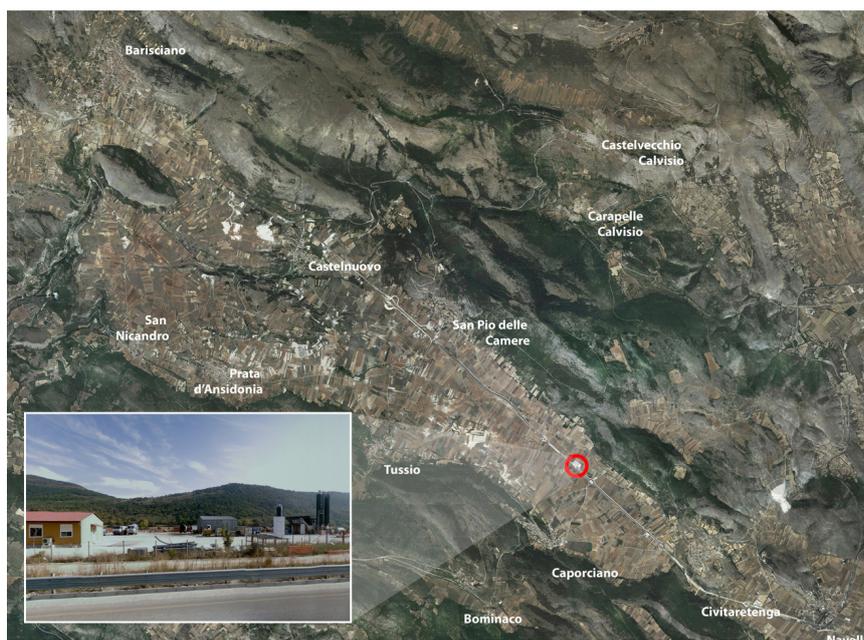


Fig. 1 Localization in Navelli's plateau territory in a already existent system.

3 Project hypothesis

3.1 Industrial production

The hypothesis of creation of cladding building production be supporting from low impact of used material life cycle. We deal with utilization of tools and machinery already existing, step in life cycle and creating local chain.

Timber life cycle for panel and frame will be realized from resource in plenty present in territory: tree conifer in adjacent wood put in management for producing cross laminated timber.

Straw life cycle will start up from already existent product as refuse of cereal working with harvester, therefore square straw bale will put into timber frame already assembled. Finally panel which are stacked to form a wall, pre-compressed to reduce settlement and then pinned together for stability, is then either plastered using a protective lime render to finish it.

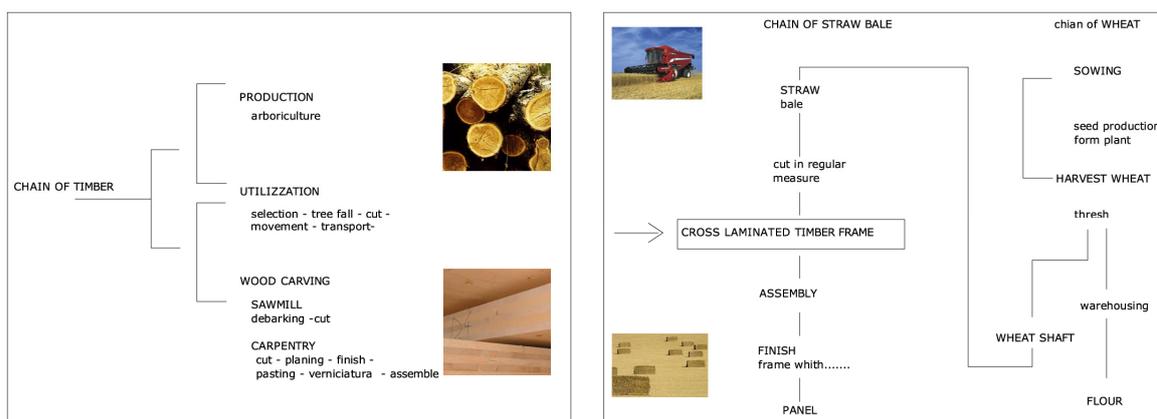


Fig. 2 Life Cycle of timber and of straw bale.

3.2 Straw bale life cycle

Life cycle of cladding panel “hearth”, start up from end of life of working cycle with harvester of cereal. The shaft are roll up from harvester in square bale. This product is carried in a shed where it will be finish cutting the lateral sides. In this way more resistant and dense part of panel will be preserved, ready for position in timber frame. Such reinforced straw bale will be staking together, held from screw.

The panel, after assembling, will be plastered with lime for becoming a breathable sheathing board. The finish panel will be ready for carring until construction site where it will be assembled. The straw bale environmental impact is carbon neutral, and the end of life of this material will be considered both for recycling and combustion or gasification as biomass for producing heat and energy.

3.3 Timber life cycle

The frame of straw bale panel will be realized with cross laminated timber, a new technology for prefabricated timber panel that allow to have an industrial product.

Concerning timber chain, we need to create a sustainable forest management starting from resource. Here’s why the process for creating straw bale panel industrial system for cladding, will be divided into two phases: the first one will start up creating chain through arboriculture and definition of management policy, the second phase, instead, will develop production of local timber panel.

To start up timber life cycle, we will utilize forest service already present, putting them in polity and we will reuse waste to energetic ends. The local sawmill will be reference frame for first working phases, in a second moment will be start up new industries for processing the product in following phases. Industrial costs of start up could will be mitigate through partnership with industrial leader in cross laminated timber production.

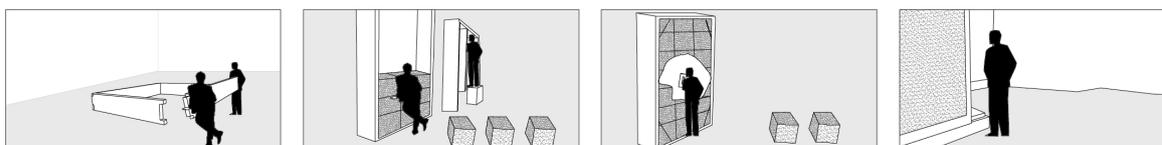


Fig. 3 Phases of panel assembly

3.4 Final product features

The final panel will be modular, both in thickness (from 39 to 49 centimetres), for answer to climatic request from the project site in which will be used, and in width (modular from 1, 2 or 3 metres of base, with height of a flat), for being flexible respect to planning requirement, but also to answer to production and transport request.

It will be possible to use it, without other workings on, in building covering, walls and floors but also in a structural system with timber.

Building with straw bales offers high levels of thermal insulation and construction speed. The excellent thermal insulation qualities of straw bales is more better than current building regulations demand and also sound reduction is more than 50db.

4 Conclusions

Make possible the chain for the prefabricated production panel in a cheap and speed way with industrial production not self-made, is important for having a sustainable reconstruction and carbon neutral, for relaunch the devastate economy, and for allow to resident population the possibility to remain in this places.

In start up phase it could be possible also to import cross laminated timber from Austria, in order to improve the local timber chain and in a second time it will be possible to producing locally the complete panel.

References

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