ANALOG FORESTRY: A SOLUTION TO INCREASE URBAN RESILIENCE

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Preface

Analog forestry (AF) is based on a synthesis of traditional knowledge and practices and the application of scientific principles, methodologies and techniques to achieve the recovery of the main functions of the ecosystem, seeking to meet the needs of farmers and the local population. Analog forestry has been developed under the concept of applying the model in sites in many distinct ecosystems, that have a dynamics and structure similar to that of a natural forest of a geographical area, in order to optimize the production of forest ecosystem services, increase biodiversity, and to enable an alternative of local sustainable development.

The present article intends to collaborate in the discussion on "urban resilience" from the contribution of the productive systems based on Analog Forestry (AF). Throughout history, cities and agriculture have been reinvented and adapted to remain in spite of disturbances. Cities currently face common problems such as urban agglomeration, pollution, depletion of resources, climate change, increased productivity and natural phenomena, among others, which require the application of adaptation and mitigation strategies for the promotion of urban resilience.

The establishment of urban areas is intimately related to the development of agriculture and from this perspective, the approach to urban issues demands an in-depth analysis. In addition, it requires an interdisciplinary approach that recognizes not only the habits and behaviors of the inhabitants, but also responses to the concrete and structural conditions for the provision of food and ecosystem services. Faced with this scenario, there is an urgent need to guide the expansion of cities, such as the Analog Forestry, as a productive model more in line with the challenges.

Analog Forestry is a complex and holistic form of forestry that seeks to promote the ecological functions of an ecosystem and considers the importance of resilience. This technique recognizes the patterns of land use and bio-geographic factors of a landscape, and identifies opportunities for the provision of socially, environmentally and economically valuable products and services.

AF systems are based on three concepts and twelve principles, related to the establishment of productive ecosystems, articulated with the architectural structure and ecological functions present in mature forests. Therefore, it considers ecological succession and landscape ecology to create stable and resilient media. For Jannsens and Torrico (2015) agricultural systems are stable and robust in the face of disturbances when they reach the "agro-climax", that is, the point of equilibrium between the natural and socioeconomic system. (Bahadur 2015) discusses the complexity of determining the point at which an agricultural system reaches the point of equilibrium or stability, which makes it difficult to measure the dynamics of the indicators towards resilience.

The management of the first urban areas did not have the means to consider natural threats as a basic criterion of territorial planning. In reference to the development of Latin American cities (Urquieta 2010), it lacks a urban policy as such. (D'Ercole et al 2009) argue that urbanization models in Latin America carry serious threats and are more vulnerable to the effects of extreme weather events. Most of the countries in Latin America have policies focused on the need for intervention and control of the emergency, but not on disaster prevention and risk management due to climatic events (Martínez, 2010). Risk management and vulnerability reduction in cities and their systems require an increase in resilience. In order to achieve a harmonious

development with the environment and with the capacity to respond to the demand for prevention actions, estimation / mitigation, preparation, warning response, and reconstruction.

There are various efforts aimed at improving the quality of life in cities and in adapting to the consequences of climate change. Urban resilience not only allows the population to recover after a catastrophe, but also has a fundamental role in the fight against climate change. In 2002, the Resilient Cities Program of UN-Habitat was proposed to implement effective solutions in cities in order to increase resilience, reduce risks, increase capacities and reduce the fragility of the impacts that may be suffered. the system (Clos, 2015). The quantification and assessment of the resilience of a system is difficult, due to the quantity and diversity of border edges that converge in this variable (Torrico, 2010, Cumming et al., 2005). This program establishes some guidelines to consider a resilient city as such, among which is the conservation of natural habitat, the protection of ecosystems and natural barriers or the revitalization of rivers are essential, where AF can play an important role.

Analog forestry is a technique that intrinsically poses resilience, since it uses natural forests as guides (see Figure 1) to create ecologically stable and socioeconomically productive landscapes. According to Ranjan (2014), farmers can aspire to resilience from the point of view of financial

capital as well as natural capital. At the same time, the AF facilitates the processes of ecological restoration and primary ecosystem services; such as oxygen, water, carbon; that support the life of the planet. However, measuring the resilience of an Analog Forestry system without a robust conceptual framework can lead to ambiguous and isolated interpretations. There are difficulties in economically quantifying several of the processes of production systems based on the resilience approach (Mazvimavi and Rohrbach, 2006, Smith et al., 2016).

According to Smith et al. (2016) agricultural systems must be adjusted to the local context, to their environment and to social and socioeconomic processes. The conversion rate of natural ecosystems in agricultural systems is high, and involves significant impacts on resources such as soil, water and air (Torrico, Peralta and Pelletier, 2017). If we value the learning generated for the development of resilient cities, we must reflect on the importance of territorial planning, linked to survival. That is, agricultural production must integrate and recognize the complexity of factors co-existing in the management of the use of space and land occupation, such as AF, which facilitates integral solutions that contribute not only to the family economy, but also to ecological restoration and the flow of natural processes. In addition to focusing on ecological sustainability, AF recognizes social and economic needs to increase resilience and productivity.

Design (mapping)

Structure of Forest (Physionomic Formula)

Ecologic Funcion of species

(Data Base)

Figure 1: Shows the basic development of the methodology of Analog Forestry into a final design for implementation

AF systems are easy to adapt and economically viable within the design of resilient urban spaces. Mainly in potential areas such as: areas of connectivity between the Protected Wild Areas, in the protection areas of water sources, within recreational parks, on public roads, in conventional agricultural systems and within established biological corridors, and that can add to the reduction of risk and vulnerability to natural or anthropogenic adverse events. AF systems have a positive effect on urban drainage in case of floods, as well as in the decrease in the amount of water that will circulate freely on the surface, decreasing flood damage, to name a benefit.

Within this scenario, Analog Forestry could play an important role in mitigating and adapting the risk to natural disasters and resilience. Adverse events, known as extreme natural phenomena, are increased by processes of human activity, for instance burning of fossil fuels, as well as disorderly urban growth and construction in areas not suitable for this purpose, aggravating the conditions of geological instability, undermining steep slopes, filling streams without planning

technique and in other cases by infiltration of sewage (D'Ercole et al., 2009).

The AF is considered as a simple, economic and highly effective solution to attack the vulnerability caused by the use and occupation of land in cities. It is important to note that for every dollar invested in disaster preparedness and prevention, between five and ten dollars in economic losses are saved (Clark, 2012). According to the World Bank (2018), one euro invested in resilience means a saving of seven euros in emergency response. Joan Clos (2015), Executive Director, UN-Habitat, indicates that the International Guidelines on Urban and Territorial Planning are designed to fill a critical gap by providing a framework for planning that can be used at different scales and adapted to national contexts, regional and local A resilient city has tools to restore its own basic urban structures and functions, after the episode suffered.

Promoting policies for the development of techniques such as Analog Forestry within the management of the territory could promote not only the food sovereignty in the cities, but enhance the resilience of these. In urban environments, the insertion of agricultural spaces must be ordered, merged, and managed in a way that ensures sustained production that facilitates connectivity between different habitats and ecological networks. Torrico and Janssens (2010), state that the development of political lines related to food sovereignty, fight against poverty and reduction of disaster risks in the formation of resilient cities that affects the quality of life of citizens and the ability to withstand a crisis.

Within the unlimited expansion of cities, transition spaces must be provided that can play as connectors with other open spaces and as separators of settlements with more rural features. This means doing a preventive work regarding the few fertile soils that have historically maintained the agrarian activity around the cities, concentrating a high biodiversity and generating territorial structures that fulfill a strategic environmental function. Promoting the installation of Analog Forestry systems, could not only guarantee the productivity and boosting of the economic of agricultural spaces, providing urban oxygen sources; in addition to pursuing a generational change for producers, recovering their traditional knowledge and fostering the transition to resilient landscapes.

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