Diagnostic tools for measuring the manufacture of Colombian traditional emerging products

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Abstract. Anise-based drink, “Bolegancho”, production represents an economic source of livelihood for families; however, its artisanal production does not comply with environmental regulations. A multidisciplinary analysis at the social, geographical, and environmental levels of “Bolegancho” production is carried out. In the first part, surveys were applied to producers, determining that they are in a socioeconomic stratum 1 and 2, where the majority are dedicated to production in their homes and not to distribution. Subsequently, the production areas were geo-referenced for the collection of water and soil samples. For the environmental component, physicochemical and microbiological tests were carried out on the “Bolegancho” and the water used to produce it, identifying the lack of sanitation and the effects on the final product; on the other hand, the results that are poured into the soil according to the analyses may be beneficial for crops due to their organic matter content. Regarding the air, microbiological tests determined the presence of different types of bacteria and fungi causing alterations in the environment, which implies that the distillation processes of the “Bolegancho” should be studied from a multidisciplinary perspective.

1. Introduction
In Colombia there is a wide variety of artisanal beverages which are typical of each region, according to their culture and tradition [1,2], currently the artisanal alcohol industries are an alternative source of economic production for families whose income is not enough to meet their basic needs and is not constituted in a legal framework.

This phenomenon can be visualized as a socio-historical process linked to the local economy, creating a construction of the state at a local level and strengthening a monopolistic state system. A result a formation of a political, cultural, social, environmental phenomenon associated with the production, circulation and consumption of alcohol in the settlement of a colonial and postcolonial political economy, has redeemed in a role of economic good [3].

From the point of view of Meza [4], the institutional and bureaucratic vision, the products of the liquor income constituted the motor of the local and regional development; from remote times until the present time, the localities and the regions where traditionally it is practiced artisan distillates, their experiences in the prohibition of this one make part of a legacy of knowledge and memories linked to
this ancestral trade. Hence the memories of persecutions, fines, confiscations and imprisonment of individuals who practiced homemade and artisanal distillation of liquors appear here as the antithesis of the evolution of income and taxation in the framework of the political and administrative formation of the Colombian departments [4,5].

The Municipality of “Río de Oro”, Colombia, suffers from marginalization due to the particular conditions of lag of human capital; in addition, the lack of application of science and technology that is evident in the critical income levels that affect the community of “Río de Oro, Cesar, Colombia”. The most important activity is agriculture; however, the majority of this activity is carried out in the rural sector. Of the rural population 82.6% are below the poverty line and of these 53.8% live in conditions of extreme poverty; the per capita income of urban dwellers is, on average, 1.8 times higher than rural [6].

The imbalance between rural and urban centers requires modifying the development model and strategies to combat the lack of opportunities. Rurality requires a multifunctional and integral approach that achieves productive agricultural productivity [7].

Alcoholic beverages have their origin in the process of alcoholic fermentation. Any sugary liquid undergoes this fermentation spontaneously due to the action of yeasts that, in the absence of air, destroy glucose and other sugars producing carbon dioxide and ethanol [8,9].

The [10] states, "One of the main responsibilities of the health sector is the protection of the public welfare by ensuring a healthy physical and social environment, which enables sustainable human development." This means that the government as an entity that protects the rights of citizens is obliged to provide public welfare, identifying environmental alterations that affect human health, mapping potential risks around the environmental impacts that may be generated on the ecosystem resources.

2. Methodology

This research is of a non-experimental descriptive type based on the analysis of direct observation in situ, within the geographical limits of the characteristics of the population, situation and/or areas of interest [11]. The surveys were carried out taking into account the sampling points located in the area, and semi-structured direct interviews were also carried out taking into account that this allows the manufacturers and distributors to be complemented according to the questions already structured in order to clarify the level of knowledge of the pollution generated. Once the results were collected, the ArcGIS program was used for the construction of the cartography, taking as three points more producers of the artisanal drink in the path "El Gitano" of “Río de Oro”, Cesar, Colombia, to perform the physical, chemical and microbiological analyzes corresponding.

The “Bolegancho” is considered a typical drink in the “Río de Oro” area of the department of Cesar, Colombia, where the study was focused, specifically the pathway "El Gitano", as it is recognized for its quality, good production and for promoting the economy of consumers and producers. The manufacturing process of the “Bolegancho” to be purely artisanal is done without complying with the sanitation norms established by the national constitution and by the sanitary registry of the “Instituto Nacional de Vigilancia de Medicamentos y Alimentos (INVIMA)”. Once the points were georeferenced, the tabulation of the survey and sampling for the water and soil matrices, was carried out.

3. Results and discussion

With the information from the surveys, tabulations were made to review the trends in the most relevant questions. In the Figure 1 the residence stratum is represented, in which the producers of the artisanal drink are found, giving as a result that 35% of the producers of the drink are in socioeconomic level one, while 65% of them are in a socioeconomic level two.

In Figure 2. It is shown the level of education of the producers. It is noteworthy that most of the surveyed producers have not had access to secondary formation and none of them had reached higher education. This is particularly important as lower education levels are related to unawareness in good manufacturing practices, health issues and security protocols, process of control and quality of an over-the-counter product.
Education can be a powerful tool in technification of a product, that can lead to the positioning of a product with good standards and boosting its economic potential. This was the case for “aguardiente”, a popular and standardized drink that started with non-formal domestic distilleries [12], similar to the current status of “Bolegancho”. After taking the complete analysis of the tabulations, we georeferenced the sampling areas for the collection of the samples in water matrices, soil (see Figure 3).

Parameters such as biochemical oxygen demand (BOD₅) and chemical oxygen demand (COD) were analyzed, which show me the behavior of the organic matter during the production process of the artisanal drink. It was found that the raw water “Agua Cruda” (AC) used did not show any result, while
the generation of “Bolegancho” (B) high values were found due to the fermentation process of the beverage (distillation) and the residual water “Agua Residual (AR)” also shows high concentrations of contaminant by organic matter. Taking into account the current regulations, specifically resolution 1594 of 1984 regulate that for a punctual discharge it should not exceed 90 mg/L, which we can clearly see that the samples of residual water AR do not meet the established standard.

On the other hand, microbiological analyzes were carried out to confirm the results described in the Figure 4, finding that there is presence of total coliforms and E. coli, which indicates the relationship with respect to BOD₅ and COD in the production of “Bolegancho” (B₁, B₂, B₃).

For the soil samples, the wastewater conditions were known and knowing that it is discharged directly to the same without any type of treatment, an analysis of the organic matter by calcination was necessary to have a projection of the affectation of the minerals that make up the soils of the area. Soil samples identified as V(1,2,3) were taken, which are samples of soil without irrigation of leachate generated by the distillation in the three sampling points, while C(1,2,3) are the samples of soil contaminated with the leachate, that results from the distillation of the artisanal drink.

With regard to the part of organic matter, according to [13] in his project to the topic of soil science, they state that organic matter above 2% content is linked to the stability of soils, having a binding power. Overall, the humic substances when joining the mineral fraction give permeability to the soil while allowing stability. Then, linking this statement with the data expressed in Figure 5, it can be deduced that soil conditions do not have sufficient content of organic matter necessary, except for point C₃ specifically the part of the contaminated soil that gave a result of 6.1% indicating that said soil may be suitable for crops.
Accordingly, other samples analyzed do not contain enough organic matter, this may be because they are soils that are constantly used for agricultural activities, and as is known, one of the causes of loss of organic matter in soils is by crop processes. In the areas from which the samples were taken if these processes are carried out and another analysis that can be done is that observing the data obtained, the percentage of organic matter in the contaminated soils was higher than the virgin soils, this possibly due to that in those places the liquid waste is poured and this waste can be considered a contributor of organic matter with respect to its conditions relating this with the results of BOD5 and COD obtained from the residual water.

4. Conclusion

“Bolegancho” means more than just an artisanal alcohol drink, in the economic sphere, it has become a very important source of income, especially for low-income families who live in rural areas and who complement their agricultural work with this activity. In the sociocultural level, this drink is a fundamental side in the identity of the municipality, being a constituent part of the popular festivals, social gatherings, artisan innovation techniques in flavors and presentations, which have generated recognition processes as a typical drink of the region. It should be noted that it is essential to legalize an artisanal drink as important as the “Bolegancho” in the area of Cesar and Norte de Santander, Colombia, to keep track of the products used to manufacture it, in order to control the impacts that it may have on health and the environmental, social and cultural environment. In this process of technification, academic centers play a very important role as agents of sociocultural change and the use of technologies for the development of new industries. It is important to form an alliance between producers and education institutions in order to avoid bad practices and environmental contamination among other hazards.

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