

ORIGINAL

Characterization of the current situation of wastewater management and its effects on the Curbinata - Valparaíso

Caracterización de la situación actual del manejo del agua residual y sus efectos en la Vereda Curbinata - Valparaíso

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ABSTRACT

This research work is due to the need to recognize and characterize the concept and management of wastewater from fish farming in its role as an environmental pollutant. This planning is among the steps to follow to obtain a sustainable fish farming that is friendly to the natural ecosystem. Although it has been adapted by some, the fish farming activity still presents difficulties due to the lack of commitment of the social parties from the fish farmer to the state organizations in their poor support of projects. The objective of this article is to recognize and evaluate the current situation of the management of wastewater from fish farming and its negative environmental effects in the lack of knowledge of the concept of wastewater management that fish farmers in the area have, in the environmental, economic and social spheres. The work was developed in the municipality of Valparaíso with the Livestock and Forestry Association of the La Curbinata area (AAPEFOCUR), together with those partners who have fish lakes. Regarding the instruments used to collect quantitative data, the interview was conducted with the leader of the association, as well as observation in the region. Regarding the results and discussion, a minimal understanding of the leader regarding management and a great deficiency of the accompanying entities specialized in wastewater was found. To guarantee a good connection between fish farming and the environment, it is necessary to first change the perception and knowledge of fish farmers in the area regarding the management of wastewater resulting from it.

Keywords: Fish Farming in Colombia; Concept of Wastewater Management; Support from State Organizations.

RESUMEN

El presente trabajo de investigación se da por la necesidad de reconocer y caracterizar acerca del concepto y manejo de las aguas residuales provenientes de la piscicultura en su rol como contaminante del medio ambiente, esta planificación se encuentra entre los pasos a seguir para obtener una piscicultura sostenible y amigable con el ecosistema natural; si bien ha sido adaptada por algunos, todavía la actividad piscícola presenta dificultades por la falta de compromiso de las partes sociales desde el piscicultor hasta las organizaciones del estado en su acompañamiento de proyectos. El objetivo del presente artículo es reconocer y evaluar la situación actual del manejo del agua residual proveniente de la piscicultura y sus efectos negativos ambientales en desconocimiento que tienen los piscicultores de la vereda, en el ámbito ambiental, económico y social. El trabajo se desarrolló en el municipio de Valparaíso con la Asociación Pecuaria y Forestal de la vereda la curbinata (AAPEFOCUR), junto aquellos socios que cuentan con lagos piscícolas. En cuanto a los instrumentos implementados para la recolección de los datos cuantitativos fue la entrevista realizada a la líder de la asociación, así mismo, la observación en la región, respecto a los resultados y discusión, se encontró una comprensión mínima de la líder acerca de los manejos y mucha deficiencia de

las entidades acompañante especializadas en aguas residuales, para garantizar una buena conexión de la actividad piscícola con el medio ambiente es necesario primero cambiar la percepción y conocimiento de los piscicultores de la zona acerca del manejo de las aguas residuales resultantes del mismo.

Palabras clave: Piscicultura en Colombia; Concepto de Manejo de Agua Residual; Acompañamiento de Organizaciones del Estado.

INTRODUCTION

In recent decades, wastewater from fish farming has increased dramatically worldwide due to the need to use this resource for various activities such as consumption. This has increased as the population has grown exponentially.⁽¹⁾ For this reason, the amount of water effluents generated will be much higher than in previous decades, caused by different urban, community, and industrial areas, which can cause latent and severe pressures on human and animal health, in addition to environmental damage.⁽²⁾ Therefore, only 34 % of wastewater is estimated to be treated worldwide.⁽³⁾

However, in Latin America, it is also necessary to reduce the percentage of water that is not managed correctly before being discharged to its final disposal site, as this activity is one of the major economies in Latin America due to the food source and jobs it generates, which makes it one of the causes of water effluent pollution, leading to problems in the loss of biodiversity (flora and fauna). According to the ^(4,5) fish farming generated an exuberant 4,6 million tons of production in that year, which generated high volumes of contaminated effluents. On the other hand, the lack of guidelines has led to inadequate management of these waters and also to a lack of support and commitment on the part of fish farmers to change traditional practices that have been in place since earlier times in favor of sustainable systems that are integrated with the environment.

In Colombia, the situation is similar to that of other countries, as 67 m³/s of wastewater is generated and ultimately discharged into water bodies near the production area. The problem is that only 8 % are adequately treated. This creates a problem for the aquatic environment and the human and animal health of all those who depend on this resource. Furthermore, there is a lack of support from service providers and little commitment from the community to acquire new technologies that are sustainable and environmentally friendly. In addition, there are no environmental regulations promoting water sovereignty.⁽²⁾ Caquetá has a wide variety of water effluents throughout the region. For this reason, fish farming is widespread in most of the area due to the high demand for food and because it uses the available resources. Therefore, it is a department that contributes to water pollution due to the lack of training to properly manage wastewater for its subsequent introduction or reuse in other daily activities for the rural population, according to ⁽⁵⁾ the best alternative to reverse these environmental problems is for each department to have guidelines that link all the responsible actors and, together, build alternatives aimed at the comprehensive sustainability of fish farming with the environment.

As for the municipality of Valparaíso, despite having only one river, it contains many natural water bodies, such as streams and lagoons, which are used by the rural population of the region, although there are many shortcomings in the area of education on the part of organizations accompanying projects related to fish farming, according to ⁽⁶⁾ five percent of the census units in the municipality are involved in fish farming and 95,4 % in agricultural activities, which shows the low importance that the community attaches to using this resource, in addition to the fact that those who use it do so poorly. In the village of La Curbinata, farmers work in agriculture, livestock, and forestry, seeking to take advantage of every resource they find and have at their disposal. One problem is the lack of comprehensive support for projects that come to the region. Although both groups had great enthusiasm at the beginning, as time passed, the entities disappeared from the project. They provided information slowly so that when the project was halfway through, the farmers still did not have the necessary knowledge to achieve good production, which led to environmental problems through the misuse of wastewater. This article aims to recognize and characterize the current situation of wastewater management from fish farming and its adverse environmental effects, given the lack of knowledge of the fish farmers in the village about the environmental and socioeconomic aspects.

METHOD

Location

This article was developed in the village of Curbinata in Valparaíso, Caquetá, with the Livestock and Forestry Association of Curbinata [AAPEFOCUR]. This is a heavily forested area with livestock and agriculture, located in the Colombian Amazon at coordinates 1° 11'36" N and 75° 42'23.0" W, at an altitude of 210 meters above sea level, with an AF climate according to the Copen classification. For the sample, farms with 10 years of fish farming experience were sought, located near the Pescado River and natural lagoons.

Characterization of the population

In the participating population, we worked with an association of 17 women who have been working in fish farming for 10 years as a source of income and food for their families. The association was founded to improve and take advantage of the resources available in the region. This initiative was made possible thanks to a project led by SENA and the leader in 2014, where lakes were built to add about 1,500 white cachama and bocachico fry, the first products to be marketed and consumed by the families in the village. All this was made possible thanks to the dedication of the rural women who strive every day to work sustainably and environmentally friendly, which is why they enthusiastically decided to participate in this project.

Methodological approach

This research is based on a critical social paradigm, as this approach allows us to understand the interrelationships between each author and the social, political, and environmental environment, taking into account subjectivity as an impossible condition to overcome in research and its research actors.⁽⁷⁾ The objective was to recognize perceptions through dialogue, identifying elements that could solve the major environmental problem in the locality, which could have repercussions for the global world.⁽⁸⁾ Qualitative research techniques were used to recognize fish farmers' knowledge and understanding of proper wastewater management.

The data was analyzed based on an interview with the key person on the subject, the leader of the association, and the criteria for selecting these points are as follows: 1. The person was one of the first founders of the fish farm. 2. The person belongs to the association and currently lives in the village and works with the lakes. 3. The person with the most experience in fish farming was selected.

The interview was conducted by cell phone because the interviewee was not in the country then. In addition, a tour of the property was conducted in previous days to assess the situation, and the key questions for the project were designed based on the observations made. Among the variables present in the dialogue were the beginnings of fish farming, knowledge as a contaminating role, the current deficit, and the economic, social, and productive benefits obtained from the activity.

The dialogue was recorded with the interviewee's permission and then transcribed into a Word document to be entered into Atlas Ti version 24.0 data processing software. There, categories and codes resulting from the analysis were established, followed by networks, and finally, triangulation and writing up of the findings.

RESULTS

The results show that the first finding is that the shape of the terrain in the region has nothing to do with the main problem, so it was not necessary to consider it when characterizing wastewater management in its role as a pollutant. The perceptions expressed in the interviews were divided into 44 categories for analysis, which are related from the outset to knowledge of proper wastewater management, the economy, social and environmental issues, and non-profit organizations.

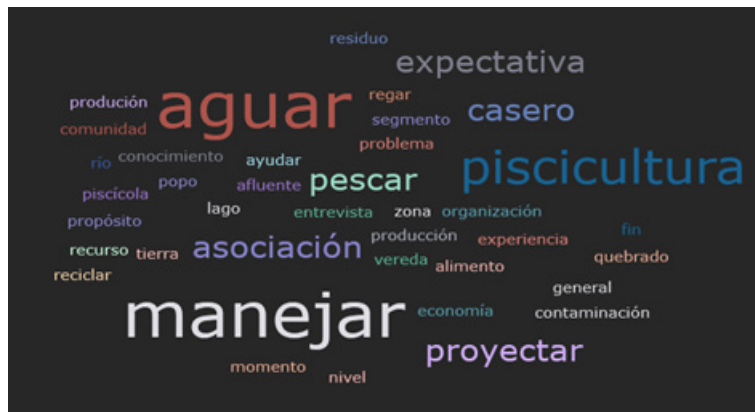


Figure 1. Word clouds. Source: Atlas Ti version 24.0.

Beginnings

As shown in figure 1, the analysis begins with the association's background in fish farming (10 years) and how, through the social skills of its leader, a project was developed with the support of the National Learning Service [SENA] and the Municipality of Valparaíso, who requested the labor of the farmers themselves to build the lakes for production. This is consistent with ⁽⁹⁾ who states that an organization's social skills involve the social interrelationships that exist between people in the same group.

On the other hand, in the early stages, the association also encountered problems due to the inadequacy of the entities accompanying the projects, as they did not provide 100 % training on the subject to be worked on,

monitored for a specific period, and then disappeared from the region. As a result, the farmers lose interest in the activity and continue with what little each of them has learned, leaving water pollution in the local area that spreads even further when the final products (fish) are sold. This is all supported by ⁽¹⁰⁾ who states that the rigor and quality of a project are guaranteed by the supervision of the service providers, ensuring that the methods used are appropriate, valid, and reliable, in addition to complying with the project's objectives. (2018) states that the rigor and quality of a project are guaranteed by the supervision of the service providers, ensuring that the methods used are appropriate, valid, and reliable, in addition to complying with established scientific and methodological standards. This is achieved through continuous monitoring by an expert in the required area to identify possible errors or deviations from the project's objective at an early stage.

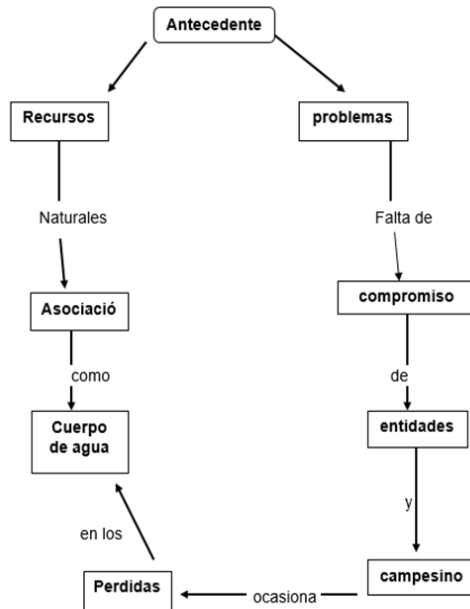


Figure 2. Beginning. Source: Atlas Ti version 24.0.

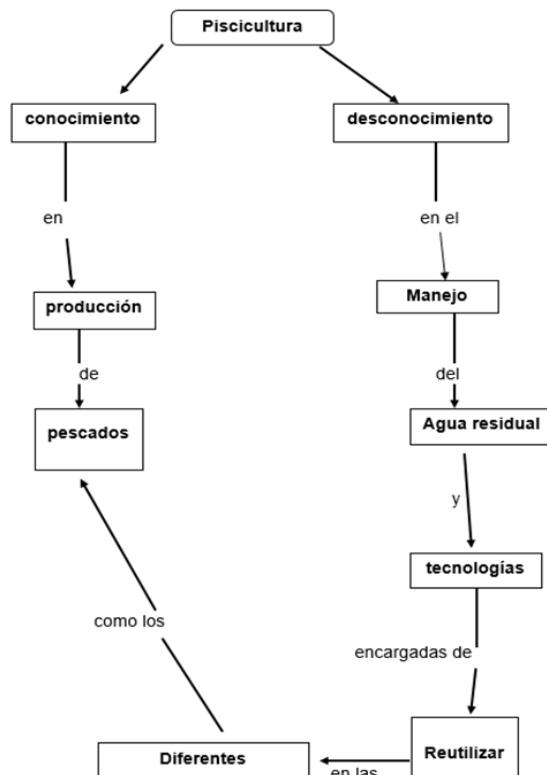


Figure 3. Wastewater management. Source: Atlas Ti version 24.0.

Environmental and Socioeconomic

Figure 3 shows that fish production is one of the association's most important economic activities, along with milk production, livestock sales, and agricultural production. In the social sphere, the association has many allies at the national and international levels, thanks to the various projects it has carried out since its foundation. Fish production is one of the association's most important projects and has received the most support from various government and private entities. Finally, the environment faces a significant challenge in the region due to the poor wastewater management from fish farming and a lack of commitment. This is supported by the following authors: ⁽¹¹⁾ in his book *Fishery Co-management*, he describes how group and community management of fish production can maximize economic benefits and equity in using local resources. In the book *Aquaculture: Principles and Practices* ⁽¹²⁾ he supports the social role in sustainable fish production. He also highlights how good cooperation within a specific group promotes better management practices, which increases resilience to environmental and economic challenges. Finally, ⁽¹³⁾ examines the environmental impacts of fish production and determines how good management can mitigate adverse effects through sustainable practices.⁽¹⁴⁾

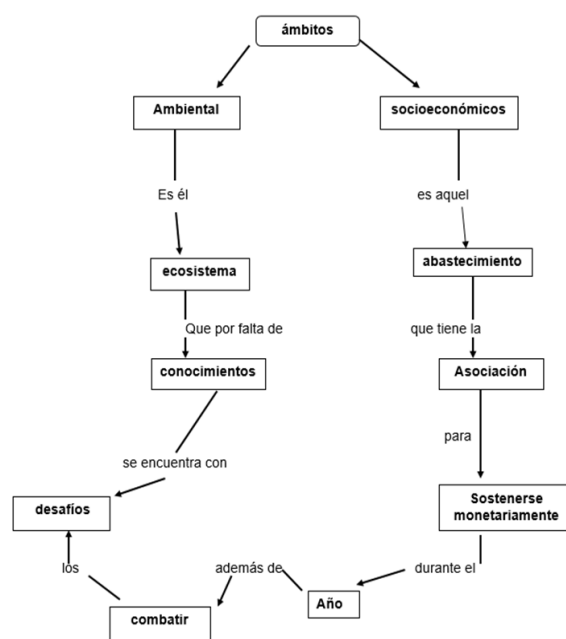


Figure 4. Economy, Socioeconomic. Fuente: Atlas Ti versión 24,0.

CONCLUSIONS

The first step in implementing sustainable and environmentally friendly fish farming is to design and learn about successful experiences with a track record of efficient production, in addition to a commitment from the farmers and service providers involved in the project. The aim is to understand all the pros and cons of implementation and recognize the technologies and strategies that can be used to overcome the difficulties involved in wastewater management.

On the other hand, fish farming can solve socioeconomic problems and help balance the association's budget throughout the year by selling fish and water for irrigation in agricultural activities and community supply through water purification.

REFERENCES

1. Cadenas MR, Lino M, Briones V, Osejos M. Water quality of the wastewater treatment plant of the city of Jijipijapa, Ecuador. *Rev Bases Cienc.* 2019;4(3):41. https://doi.org/10.33936/rev_bas_de_la_ciencia.v4i3.1838
2. González Fragozo HE, Zabaleta Solano C, Devia González J, Moya Salinas Y, Afanador Rico O. Efecto del riego con agua residual tratada sobre la calidad microbiológica del suelo y pasto King Grass. *Rev U.D.C.A Actual Divulg Cient.* 2020;23(2).
3. Sánchez RG, García Gualoto KJ. Tratamiento de aguas residuales con cargas industriales con oxidación avanzada en sistemas convencionales. *La Granja.* 2018;27(1):103-11.

4. Organización de las Naciones Unidas para la Alimentación y la Agricultura (FAO). *Aquaculture development. Ecosystem approach to aquaculture*. FAO Technical Guidelines for Responsible Fisheries No. 4. Rome: FAO; 2018.
5. Rojas A, et al. Desarrollo sostenible en la piscicultura de Caquetá: retos y oportunidades. *Rev Ecol Trop*. 2020;58(2):75-89.
6. Departamento Administrativo Nacional de Estadística (DANE). Estadísticas actividades de producción del Valparaíso - Caquetá. 2005.
7. Gutiérrez ML. Los enfoques filosóficos de generación del conocimiento y las apuestas metodológicas que exigen. Curso: Investigación Cualitativa Aplicada a la Ciencia Política. Bogotá: Universidad Javeriana; 2014.
8. González G, Gómez CA, Sánchez CV. La educación y la gestión ambiental en la industria azucarera: una experiencia comunitaria en la localidad de La Adela, Cuba. *Rev FACCEA*. 2016;6(2).
9. Patricio M, Maia FJ, Bezerra C. Las habilidades sociales y el comportamiento infractor en la adolescencia. *Subj Proces Cogn*. 2015;19(2):17-38.
10. Creswell JW, Poth CN. *Research design: qualitative, quantitative, and mixed methods approaches*. 5th ed. Thousand Oaks (CA): SAGE Publications; 2018.
11. Pomeroy RS, Rivera-Guieb R. *Fishery co-management: a practical handbook*. Oxfordshire: CABI Publishing; 2006.
12. Pillay TVR, Kutty MN. *Aquaculture: principles and practices*. 2nd ed. Oxford: Blackwell Publishing; 2005.
13. Naylor RL, Goldburg RJ. Effect of aquaculture on world fish supplies. *Nature*. 2000;29(3):50-5.
14. Asano T, Burton FL, Leverenz HL, Tsuchihashi R, Tchobanoglous G. *Water reuse: issues, technologies, and applications*. New York: McGraw-Hill; 2007.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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