



(RESEARCH ARTICLE)



PERCEPTIONS OF LOCAL COMMUNITIES REGARDING THE ISSUE OF INVASIVE AQUATIC PLANTS IN THE BAYA RIVER (KOUN-FAO DEPARTMENT, NORTHEASTERN CÔTE D'IVOIRE)

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ABSTRACT

Understanding local populations' perception is essential to developing effective policies for the sustainable management of ecosystems. The Baya River is an aquatic ecosystem whose waters are currently overgrown with large clumps of invasive aquatic plants. To address this ecological problem, this study set out to analyze the perceptions of riverside communities regarding the issue of invasive aquatic plants clogging the surface of the Baya River. To carry out the study, a survey was conducted among residents of three communities along the river. The profiles of the respondents and the percentages of responses regarding the issue of invasive aquatic plants were analyzed. The results revealed that the Baya River is a vital water resource for the residents of Koun-fao, Kouakoukrakro, and Koun-ahounzi, as nearly 61% of those surveyed use water from the river for various purposes. However, nearly half of the respondents (47%) are unaware of the impacts that invasive aquatic plants can have on the river's water body. The surveyed populations report that they never undertake collective action to combat these plants. Consequently, the issue of invasive aquatic plants should be the subject of awareness campaigns targeting communities and local public authorities to foster a greater understanding of the need for sustainable control of these harmful plants.

Keywords: Invasive Aquatic Plants, Water Body, Community Opinion, Baya River, Côte d'Ivoire

1 INTRODUCTION

An invasive plant is a non-native plant species that, after overcoming the natural barriers to its spread and benefiting from a competitive advantage, is able to rapidly colonize new habitats and become dominant there [1]. Today, changes in land use due to human activities favor the establishment, abundance, and proliferation of invasive plants [2]. Unfortunately, the spread of these invasive plants represents one of the main threats to biodiversity on a global scale [3]. According to [4], the invasion of exotic plants has become a major concern because it disrupts aquatic ecosystems, which play a crucial role as reservoirs of biodiversity and essential sources of food and income for many human populations. Indeed, invasive aquatic plants generate considerable economic costs both globally and in Africa. Between 1975 and 2020, losses related to their proliferation exceeded 32 billion dollars [5]. According to these authors, these species disrupt ecosystem integrity by limiting biodiversity, obstructing waterways, and increasing the risk of flooding.

In Africa, agricultural losses due to invasive aquatic plants amount to approximately 3.6 trillion dollars each year, which is 1.5 times the continent's combined Gross Domestic Product (GDP) [6]. Given all these impacts associated with invasive aquatic plants, several management measures have been adopted to better preserve the integrity of aquatic ecosystems. These measures are based on integrated approaches combining biological, mechanical, and chemical techniques [7]. Furthermore, the active involvement of local communities plays a key role in ensuring the effectiveness of interventions and preventing the accidental reintroduction of these species [8]. These authors also emphasized that the synergy between technological innovation and local knowledge contributes to more effective and sustainable management of invasive aquatic plants. In West Africa, particularly in Côte d'Ivoire, most aquatic environments are overrun by invasive aquatic plants that have harmful ecological effects [9]. Among the most prolific species are *Eichhornia crassipes* and *Pistia stratiotes*, which form vast floating mats on the surface of water bodies, thereby disrupting photosynthesis in native aquatic species [10]. These same authors also pointed out that other species, such as *Echinochloa pyramidalis* and *Nelumbo nucifera*, contribute to the silting up of water bodies and their gradual drying up, thereby altering hydrological dynamics. As a result, it is urgent to implement management measures to restore and preserve the integrity of aquatic ecosystems.

In the northeastern part of the country, on the outskirts of the town of Koun-fao, flows the Baya River, a tributary of the Comoé River. This waterway is currently heavily infested with invasive aquatic plants. Given the potential loss of ecosystem services provided by this river due to the proliferation of invasive plants, it has become urgent to clear the water's surface of these aquatic plants. It bears repeating that more effective and sustainable control of invasive aquatic plants requires the active involvement of local communities. However, there is currently no understanding of how riverside communities perceive the problem of aquatic plants proliferating on the surface of the Baya River. Therefore, this study addresses the key concern of determining the level of knowledge among riverside communities regarding the impact of invasive aquatic plants and their degree of involvement in controlling these harmful plants. The study's overall objective is to analyze the perceptions of residents regarding the phenomenon of invasive aquatic plants clogging the surface of the Baya River. Specifically, the study aims to assess the level of knowledge among residents regarding invasive aquatic plants and their impacts, as well as the extent of their involvement in combating these invasive plants.

2 METHODOLOGY

2.1 Study area

The Baya River flows through the subprefecture of Koun-fao, located in northeastern Côte d'Ivoire in the Gontougo region. The Baya River flows specifically near the town of Koun-fao, making it an integral part of the river's watershed (Figure 1). In the region, the rainy season generally extends from June to October with heavy rainfall, particularly intense between June and September, while the dry season lasts from November to May, characterized by a sharp decrease in precipitation [11]. Due to human activities, part of the riparian vegetation along the waterways has been replaced by agricultural crops and plantations, notably cashews, cocoa, and coffee, which are major cash crops in the region [12].

2.2 Data Collection

A sociodemographic survey conducted over two days, from May 7 to 8, 2025, involved conducting semi-structured interviews with residents living along the Baya River. Specifically, a questionnaire was administered individually to respondents in the town of Koun-fao and the villages of Kouakoukrakro and Koun-ahounzi, which are the communities closest to the Baya River. The number of respondents was determined using sampling table of [13], adapted from the work of [14]. Indeed, for this study, based on an estimated margin of error of 7%, a 95% confidence level, and a total population of approximately 7,642 people, comprising 1,595 individuals from the locality of Kouakoukrakro, 561 from Koun-ahounzi, and 5,488 from the town of Koun-fao [15], a sample size of 195 individuals was targeted; this figure is close to the theoretical sample size of 198 found in Tounsi table [13]. Thus, using stratified random sampling, 120 people

were surveyed in the town of Koun-fao, and 42 and 33 people respectively in the villages of Kouakoukrakro and Koun-ahounzi. The questionnaires were designed, on the one hand, to establish the profile (age, gender, education level, etc.) of the respondents. Second, questions regarding the Baya River and the issue of invasive aquatic plants (IAPs) were addressed, including the ecosystem services provided by the river, human activities carried out along its banks, the population's level of knowledge about IAPs, the impact of their proliferation, and methods for controlling and managing IAPs.

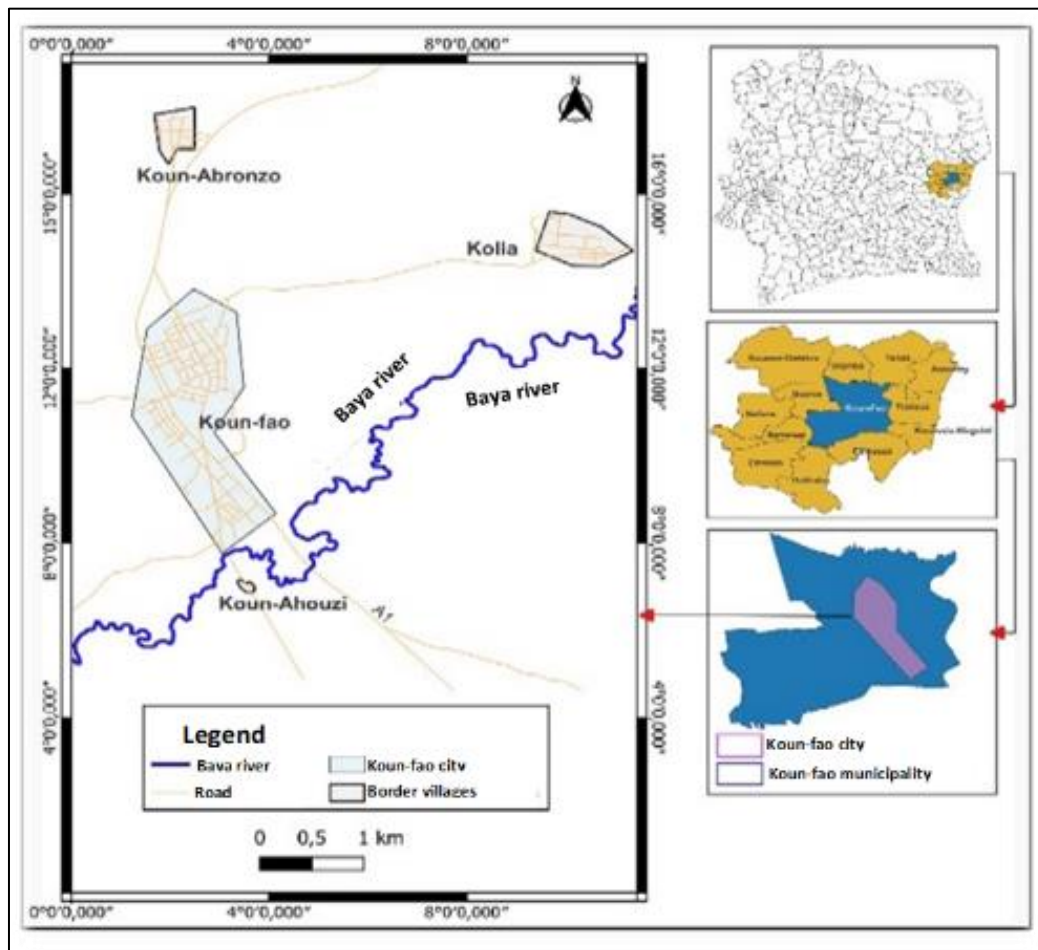


Figure 1: Geographical location of Baya river

2.3 Statistical data processing

The data collected from the interviews were subjected to statistical analysis. Specifically, the qualitative variables derived from the respondents' answers were analyzed using histograms and pie charts. Comparisons of response percentages were performed using the chi-2 test for comparing proportions. The chi-2 test of independence was applied to assess whether there was a significant relationship between the variables. These tests were performed using the XLSTAT software, which is integrated into Excel. A correspondence analysis (CA) was used to highlight, on a factor map, the significant relationships between the categories of two qualitative variables: the opinions of residents regarding the impacts of invasive aquatic plants (IAPs) and the occupations of the respondents. This analysis was performed using R software, version 3.2.0 2.

3 RESULTS

3.1 Sociodemographic Profile of Respondents

3.1.1 Gender

As part of this study, the majority of those surveyed were male (68.5%). Women accounted for only 31.5%.

3.1.2 Age class

Across the entire study area, the ages of the respondents range from 16 to 70 years. The majority fall into the 41- to 50-year-old age group (29%). This percentage differs significantly ($\chi^2 = 42.6$; $p < 0.001$) from that of the youngest respondents, aged 10 to 20 (9%), and from that of older adults aged 51 to 70 (10.1%) (Figure 2).

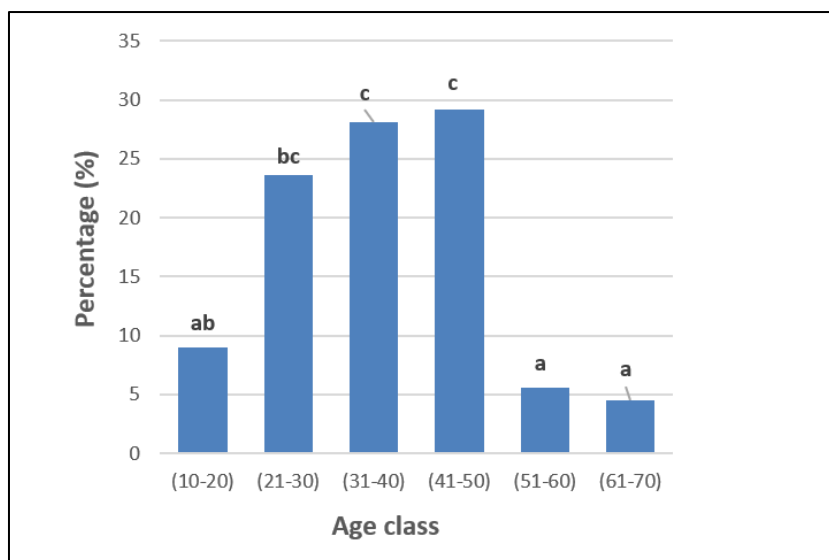


Figure 2: Histograms of age classes of respondents

3.1.3 Level of education

Regarding educational attainment, 32 respondents had never attended school (22.9%), and 108 had attended school (77.1%). Among those who had attended school, only 6.4% had a higher education, and 2.8% had a primary school education (Figure 3). Respondents with a secondary education constitute a significant majority ($\chi^2 = 41.5$; $p < 0.001$), accounting for 67.9% of the total.

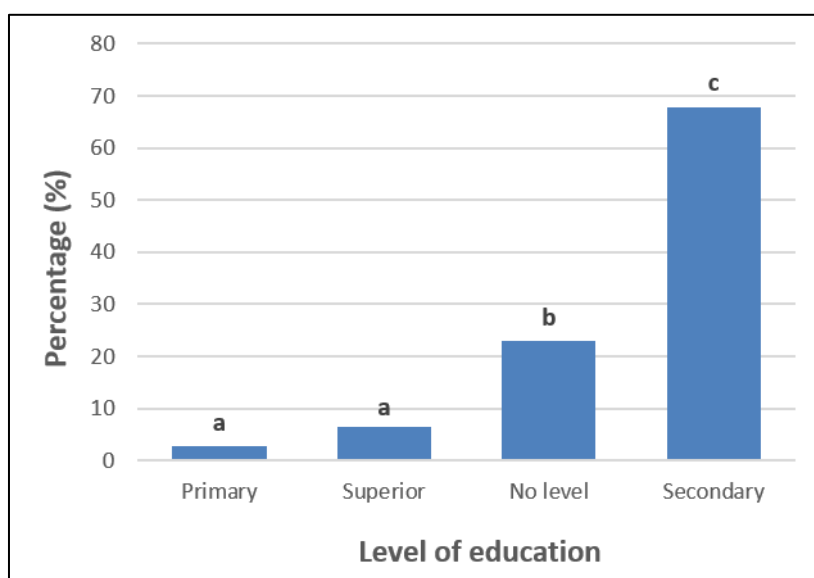


Figure 3: Histograms of education levels of respondents

3.1.4 Socio-professional activities

The local residents surveyed have diverse professions. They include artisans, public and private sector employees, administrative and traditional authorities, farmers, merchants, fishermen, and the unemployed. Most of the respondents are public-sector employees. They account for 24.7% of the total population surveyed. The unemployed come in second place, at 19.01%.

3.2 Ecosystem services provided by the Baya River

The Baya River is a vital water resource for riverside communities, as nearly 61% of those surveyed use water from this river for various purposes, including crop irrigation (9%), domestic water needs (25%), swimming (16%), and fishing (12%) (Figure 4). The riverbanks are visited for recreational hiking and used for gathering firewood. These last two activities were mentioned by 7% and 11% of respondents, respectively. However, 20% of respondents stated that they never visit the Baya River.

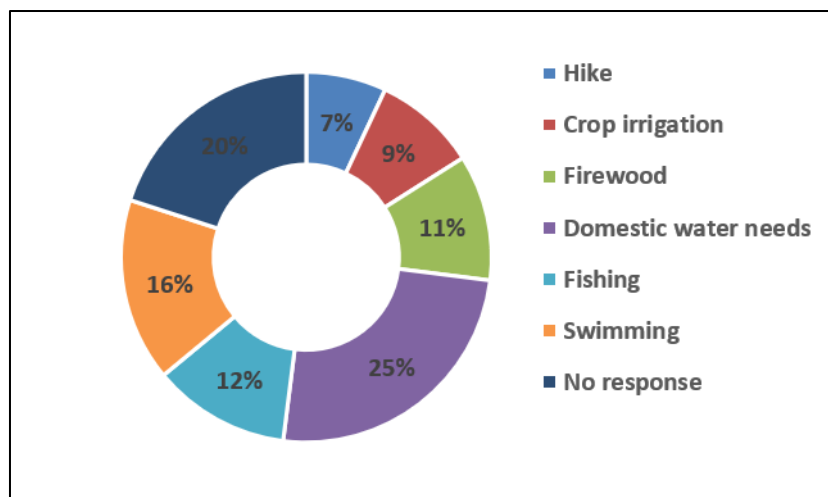


Figure 4: Diagram of distribution of ecosystem services

3.3 Human activities carried out along the riverbanks

The main human activities carried out on the land adjacent to the Baya River were listed by the people interviewed. They mentioned vegetable farming, cashew and coffee cultivation, and gold panning. Vegetable farming along the riverbanks was mentioned by the majority of respondents (33.7%). Next, gold panning was mentioned by 28%. Cashew and coffee cultivation were mentioned by 11.2% and 2.2% of respondents, respectively. It was noted that 24.7% of respondents did not mention any activities (Figure 5).

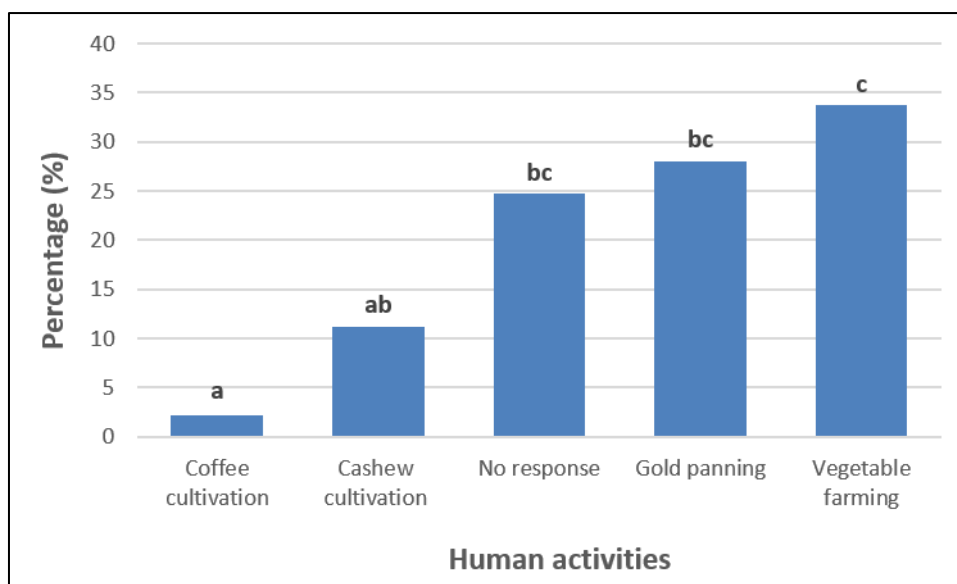


Figure 5: Histograms of distribution of human activities along the Baya River

3.4 Level of knowledge of populations about the IAPs and their impacts

All respondents admitted to being familiar with invasive aquatic plants. However, nearly half of the respondents (47%) were unaware of the potential impacts of invasive aquatic plants. This percentage differs significantly ($\chi^2 = 32.4$; $p < 0.001$) from the percentages recorded for those who had some information about the impacts, particularly the obstruction of navigation (21%), disruption to fishing (19%), and health risks (13%).

3.5 Relationship between profession and level of populations knowledge about the impacts of IAPs

The chi-square (χ^2) test of independence indicates that there is a significant relationship between occupation and the population's level of knowledge regarding the impacts of IAPs. ($\chi^2 = 41.6$; $P < 0.05$). In the factorial plot, 92.7% of the variance in the relationships between the variables is explained by the first two axes, 1 and 2. An examination of the factor plot reveals four groups: Group 1, located in the positive plane of Axis 1, consists of employees from both the private and public sectors. The majority of these individuals cited navigation obstacles as the main impact of the proliferation of IAPs (Figure 6). Group 2 is characterized in the negative plane of Axis 1. It includes artisans, merchants, and the unemployed, who did not provide any responses regarding the consequences of the proliferation of IAPs. Axis 2, in the positive plane, describes Group 3, which consists of farmers. They tended to mention the risk to human health. Finally, Group 4 is represented in the negative plane of Axis 2 by fishermen, who cited disruption to fishing as the main impact of IAPs on the surface of the Baya River.

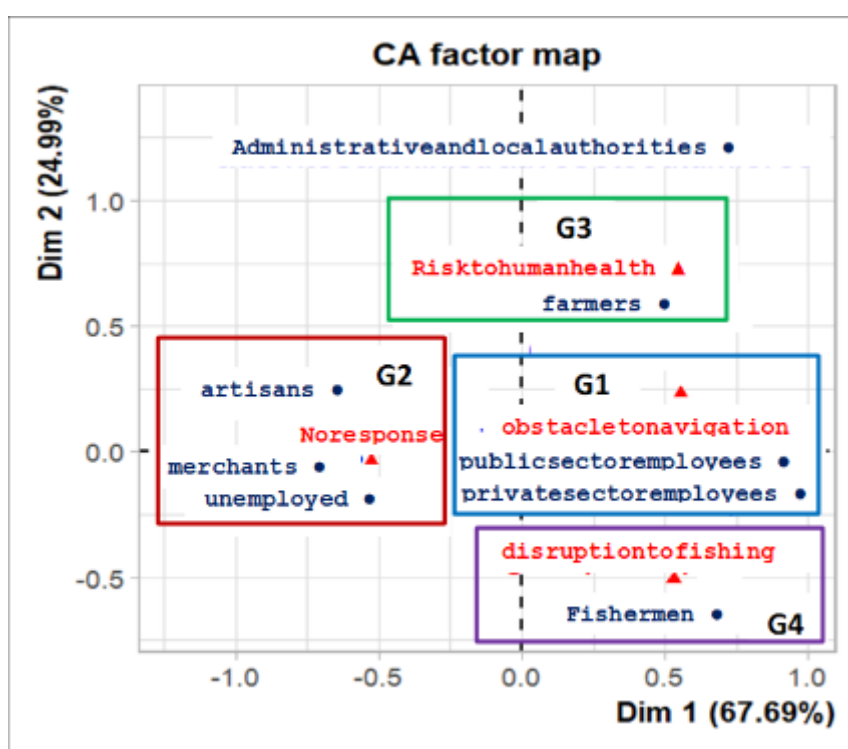


Figure 6: Distribution of the population's level of knowledge about the impacts of IAPs by profession

3.6 Level of knowledge and engagement among the population regarding methods for monitoring and controlling IAPs

Among those surveyed, 70% are familiar with methods for managing and controlling invasive aquatic plants, while 30% have no knowledge of these methods. Although the people surveyed are more or less familiar with some methods for controlling invasive aquatic plants, they have never undertaken a collective effort in the town of Koun-fao to combat these plants, which are proliferating on the surface of the Baya River.

4 DISCUSSION

The predominance of men (68.5%) among those interviewed, with a majority of adults aged 41 to 50 years and having diverse professions, represents the demographic profile of an active population living around the Baya River. This population is directly involved in the exploitation of the river's resources. The demographic structure observed in this study is similar to that reported by [16] in Burkina Faso, where these authors showed that adults with professional experience are the primary sources of information on natural resources. The Baya River is perceived as a vital resource given all the ecosystem services it provides to the riverside communities of Koun-fao. This finding is consistent with the

observations of [17] in Ghana, where riparian communities associate water bodies with essential cultural and economic functions. Consequently, riverbanks are currently subject to anthropogenic pressures such as urbanization and agriculture, which intensify erosion and pollution of these aquatic habitats [18]. Several studies have shown that invasive aquatic plants such as *Eichhornia crassipes*, *Potamogeton pectinatus*, *Nymphaea lotus*... proliferate when the aquatic environment is excessively enriched with nutrients [19]. In the case of the Baya River, agricultural practices along the riverbanks are considered the primary sources of pollution in the Baya River and are therefore believed to be responsible for the proliferation of invasive plants. This assertion is supported by the findings of several studies, notably those by [20] on the tributaries of the Bandama River, where it was demonstrated that riparian farming and extractive activities promote eutrophication and the proliferation of invasive aquatic plants.

The results of this survey showed that nearly half of the respondents had no information about the impacts of the spread of invasive plants and that only 6.4% had attained a higher level of education. This corroborates the findings of [21] in the Cavally region, who highlighted the link between low educational attainment and the lack of information on environmental impacts. Indeed, artisans, merchants, and the unemployed in the towns of Koun-fao, Kouakoukrakro, and Koun-ahounzi are the least informed about the impacts of the proliferation of invasive aquatic plants on the Baya River's water body. Consequently, they represent the most vulnerable group toward which an awareness campaign should be directed. Furthermore, the lack of local preventive measures and coordinated control efforts appears to be exacerbating the proliferation of invasive plants in the river. Consequently, the public authorities in the municipality of Koun-fao should implement a policy to combat these invasive plants in order to completely clear the riverbed, which is being choked by the weight of the vegetation.

5 CONCLUSION

This study provided insight into the level of knowledge among local residents regarding invasive aquatic plants and their impacts on the surface of the Baya River. Despite the socio-economic risks associated with the proliferation of invasive aquatic plants, local communities have not adopted any collective strategies to combat them. It is therefore urgent for local authorities to implement educational, participatory, and ecological measures to curb the encroachment of invasive aquatic plants on the Baya River's riverbed.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

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Disclosure of conflict of interest

The authors have not declared any conflict of interest.

REFERENCES

- [1] Akodewou A, Oszwald J, Akpavi S, Gazull L, Akpagana K, Gond V. The issue of invasive plants in southern Togo (West Africa): insights from landscape systems analysis and remote sensing. *Biotechnology, Agronomy, Society and Environment*. 2019; 23(2):88-103.
- [2] Montserrat V, Ibáñez I. Plant invasion in the landscap. *Landscape ecology*. 2011; 26:461-472.
- [3] Maxwell S, Fuller R, Brooks T. Biodiversity: The ravage of guns, nets and bulldozers. *Nature*. 2016; 536:143-145.
- [4] Pyšek P, Richardson DM, Rejmánek M. Invasive species in the aquatic environment: Impacts on biodiversity, ecosystem services, and human livelihoods. *Biological Reviews*. 2020; 95(4):1121-1145.
- [5] Macêdo WV, Harpøth RD, Poulsen JS, de Jonge N, Fischer CH, Agneessens LM, Nielsen JL, Biller P, Rickers CK, Vergeynst L. Anaerobic digestion of wastewater from hydrothermal liquefaction of sewage sludge and combined wheat straw-manure. *Bioresource Technology*. 2024; 399 130559. <https://doi.org/10.1016/j.biortech.2024.130559>
- [6] Eschen R, Bekele K, Mbaabu PR, Kilawe C J, Eckert S. Data from: *Prosopis juliflora* management and grassland restoration in Baringo County, Kenya: Opportunities for soil carbon sequestration and local livelihoods. *Dryad Digital Repository*. 2021. <https://doi.org/10.5061/dryad.4xgxd258c>

- [7] Hussner A, Stiers I, Verhofstad MJJM, Bakker ES, Grutters BMC, Haury J, van Valkenburg JLCH, Brundu G, Newman J, Clayton JS, Anderson LW J, Hofstra D. Management and control methods of invasive alien freshwater aquatic plants: a review *Aquatic Botany*. 2017; 136:112-137. <https://doi.org/10.1016/j.aquabot.2016.08.002>
- [8] Gatonou KM, Abotsi KE, Sodjinou KE, Abotsi YD, Hoareau A. Challenges of combating invasive aquatic plants: perspectives of populations in southern Togo. *Journal of Animal and Plant Sciences*. 2023; 58(3):1023-1038.
- [9] Egnankou WM. Monitoring the extent of aquatic plant invasion in water bodies. UNDP/GEF/IVC/G31 Project. Synthesis Report; 2006. 8 p.
- [10] Neuba DFR, Kouadio KY, Kouamé B. Impacts of invasive aquatic plants on water resources and water uses in southern Côte d'Ivoire. *Science and Nature*. 2014; 11(1):77-86.
- [11] N'Guettia GK, Mangoua JMO, Aboua NK, Douagui AG, Goné LD. Hydrogeochemical characterization of groundwater in the Baya watershed, eastern Côte d'Ivoire. *International Journal of Biological and Chemical Sciences*. 2019; 13(1):774-785.
- [12] FIRCA. Interprofessional Fund for Agricultural Research and Advisory Services, Ginger Sector. Research Report; 2020. 14 p.
- [13] Tounsi G. Strategies for determining sample size. *Academia*. 2025. DOI: 10.13140/RG.2.2.32341.90086
- [14] Yamane, T. *Statistics: An Introductory Analysis*. 2nd Ed., New York: Harper and Row. 1967.
- [15] INS, RGP. Directory of Localities: Gontougo Region. 2014; 50 p.
- [16] Sop TK, Oldeland J. Local perceptions of woody vegetation dynamics in the context of a greening sahel: A case study from Burkina-faso. *Land degradation & development*. 2011; 22(6):503-516.
- [17] Boakye PG, Dapaah-Siakwan S, Gyau-Baokye P. Sources of rural water supply in Ghana. *Water International*. 2008; 26(1):96-104.
- [18] Luke SH, Slade EM, Gray CL, Annammala KV, Drewer J, Williamson J, Struebig MJ. Riparian buffers in tropical agriculture: Scientific support, effectiveness and directions for policy. *Journal of Applied Ecology*. 2019; 56(1):85-92.
- [19] Dembélé M, Dagno K, Doumbia B, Diawara B, Karembé M, Sarra S. Analysis of invasive aquatic flora in the irrigation networks of the Office du Niger in Mali. *Afrique SCIENCE*. 2023; 23(6):72-83.
- [20] Zoro BA, Kouadio KZ, Soro TA. Effects of agro-pastoral activities on the physicochemical parameters and zooplankton assemblages of the Upper Bandama River basin (Côte d'Ivoire). *Journal of Applied Biosciences*. 2013; 20(2):1234-1245.
- [21] Brou LA, Kouassi KL, Yao AB, Kouadio ZA, Konan KS, Konan KF, Kamagaté B, Koné D. Hydro-Climatic Variability and Human Activities Impact on the Morphology of the Cavally River Bed, Western Côte d'Ivoire. *OALib*. 2019; 6(9):1-14.