



Access and Use of Latrines for Everyone? The Case of the Far North Region (Cameroon)

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Authors' contributions

This work was carried out in collaboration among all authors. Author PN designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors GVDW, CW and AA managed the analyses of the study. Authors AF and JPFN managed the literature searches of the manuscript. Author AAP managed the translation of the manuscript. Authors CNT, ESK and WALN corrected the last version the manuscript. Author JMB Designed the study. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Difficulty of access to and use of decent latrines is one of the major concerns of our century. This, as it affects more than one billion people, particularly in the developing world. Even more, it affects the health of people and seriously hinders their development as well as their mental and social well-being. It is as a prelude to the foregoing that this study was conducted with the aim of assessing the type of devices and their level of use by households in Far North of Cameroon.

Methodology: An investigation was conducted among 1,050 households selected in a stratified manner in 56 villages in 10 communes of the Far North region during the year 2016. This through an evaluation of the type of device, as well as their level of use by households in this region.

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Results: More than 80% of the latrines encountered are unimproved because they do not allow a safe separation between feces, humans and the environment. The percentage of use of these devices is 92.5% for the households surveyed, which is below the national level estimated at 94%. The non-users of latrines are either non latrine holders or latrine holders who prefer to relieve themselves in the open air.

Conclusion: The study revealed that the majority of households use latrines. However, these latrines are mostly unimproved. Open defecation is still practiced in some localities.

Impact of the study: This study provides the baseline situation for latrine use in the Far North and thus marks the starting point for any intervention to improve the situation of latrine access in this region.

Keywords: Access; Cameroon; Far North; latrines; use.

1. INTRODUCTION

Latrine is a place or structure designed to receive and store excreta and sometimes to process it [1]. They are thus one of the key elements in the sanitation chain for this type of waste. Commonly called toilet facilities, it is one of the most important amenities of a household. They are a factor of social promotion insofar as its possession brings to its owner dignity and respect for oneself and one's environment [2]. They also contribute to health protection, as they allow the separation of faecal matter from human beings and thus reduce the spread of perifaecal diseases and their consequences. In absence of latrine some fecal-oral diseases like diarrhea, and intestinal nematode infections such as ascariasis, trichiasis and hookworm can be spread in the community [3]. It is also the case with respirations infections, skin infections like geo-helminthes, and trachoma which are entirely attributable to inadequate sanitation facilities [4]. The latrine is also a tool for environmental protection because when the toilet is built according to standards, it contributes to the protection of environmental components (soil, air, water) against faecal pollution [5]. The UN goes further by recognizing the right of access to the latrine as a universal right, stating in article A/70/169 of 17 December 2015 that every human being has the right to have access to sanitation services that ensure privacy and dignity, and that are physically accessible and affordable, safe, hygienic, secure, socially and culturally acceptable [6]. The same is true of the Sustainable Development Goals (SDGs), which state that a population cannot truly develop if it does not have sustainable access to a latrine in addition to water. It is in line with the above that the international community, through the World Bank, the IMF, UNICEF, WHO and non-governmental organizations such as Bill and Melinda Gate, has been investing for

almost two decades in sanitation and related sectors.

However, latrine ownership, and even more so its use in developing countries, is not the most widely shared. According to the WHO/UNICEF Joint Monitoring Programme (JMP), the number of people in sub-Saharan Africa without access to a latrine by 2015 was 695 million [7]. Cameroon is no exception to this somewhat alarming situation. In this country, the rate of access to an improved latrine was 62% and 27% respectively in urban and rural areas in 2015 [8]. These proportions are a good indication of the disparities in access to latrines between urban and rural areas. It is even more pronounced in the Far North region of Cameroon where less than 26% of the population has access to a decent sanitation facility [9]. On the eve of the deadlines set by the National Sanitation Strategy for the achievement of the MDGs, can we say without fear of error that the sanitation targets will be met? The answer to this question remains mixed. This insofar as the indicators produced and published in different international (JMP) and national (National Sanitation Strategy) reports give an overall situation of the country, without taking into account the disparities that exist between the different regions of the country. These different statistics also give an overview of the ownership or not of latrines [10,11], without any relevant information on how these facilities are used, their management at the household level and also on the treatment, evacuation and/or reuse of excreta once the system is filled [5]. For ownership of a latrine is not always synonymous with its use, as has been found Garn et al. [12] and Barnard et al. [13] in their studies where although latrines are built within households, some household members continue to practice open defecation. It is in anticipation of the above that this study was conducted with the aim of providing sustainable solutions to this

problem in Cameroon. The objective of this study is to assess the type of devices and their level of use by households in this region.

2. MATERIALS AND METHODS

2.1 Study Site

The study took place in the Far North region, one of the ten regions of Cameroon. It was created by Presidential Decree No. 83/392 of August 22, 1983 following the division of the former North Province into three provinces (Adamaoua, North and Far North). It became the Far North region in 2008. It covers an area of 34,262 km² or more than 7% of the national territory and extends between the 10th and 13th of North Latitude and the 13th and 15th of East Longitude. It stretches nearly 325 km from the Sudanian zone to the shore of Lake Chad [14]. It is subdivided into 6 divisions (Diamaré, Logone and Chari, Mayo Danay, Mayo Kani, Mayo Sava, and Mayo Tsanaga) that include 47 subdivisions (municipalities). Climatically, it is a transition zone between the desert regions in the north and the increasingly humid Sudanian climate in the south [15]. With an estimated population of

4,208,433, the Far North region is one of the most populated regions in Cameroon [9]. This region has a predominantly youthful structure, with children and adolescents under 15 years of age representing 51% of the regional population (compared to 43.6% nationally) and this population is predominantly rural (77.3%). Overall, population growth is high and sustained by a fertility rate that remains high, averaging 6.8 children per woman between 15 and 49 years of age [16]. The urbanization rate is 24.1%, well below the national rate of about 52% [17]. The population of the Far North region is made up of a mosaic of peoples composed of sedentary and transhumant. The majority of heads of households work in the agricultural sector (59.3%).

The data collection was conducted from June 10 to June 25, 2016 in 10 municipalities of the region, distributed into three departments as follows (Kaélé, Mindif and Moutourwa) in the Mayo Kani department, (Mora, Kolofata and Tokombéré) in the Mayo Sava department and 4 (Mokolo, Koza, Hina and Souledé-Roua) in the Mayo Tsanaga department. A total of 1,050 households in 52 villages (Fig. 1).

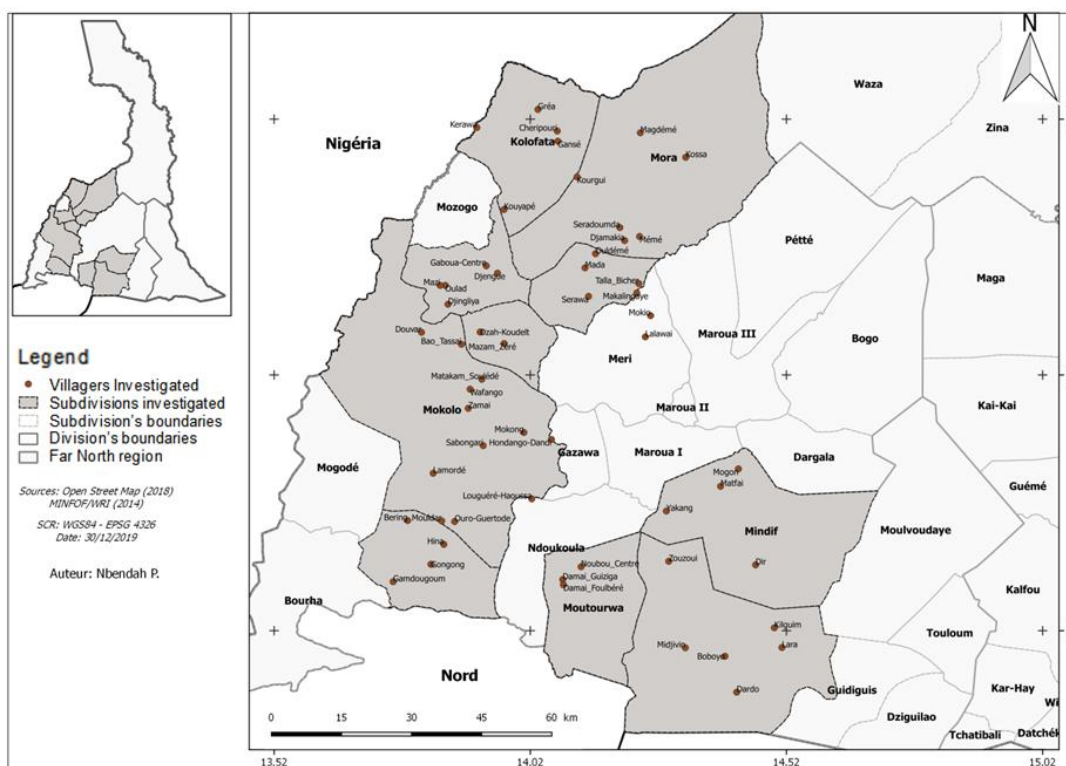


Fig. 1. Study area presenting the villages investigated

2.2 Sampling Method

2.2.1 Sample calculation

The target population is households (a group of related or unrelated persons who recognize the authority of one and the same person (the head of the household), live in the same dwelling, often eat meals together and meet the household's current expenses) [18,19]. The sample size is the number of households to be surveyed.

The sample size was calculated using the formula developed by the United Nations (2010)

$$n = (z^2)(r)(1 - r)(f)(k)/(P)(\bar{n})(e^2) \quad (1)$$

Where:

- n is the sample size
- z is the required confidence level, which has a value of 1.96 for a confidence level of 95%.
- r is an estimate of one of the key indicators to be measured in the survey, which in our case is the rate of access to improved sanitation, which has a value of 5% in the Far North region [20];
- f is the sample design effect (deff), which typically defaults to 2.0 (in the absence of empirical evidence from previous or similar surveys) [21];
- k is the multiplier to take into account the expected rate of non-response, which is assumed to be 5 per cent because it is usually less than 10 per cent in developing countries [21];
- p is the proportion of the total population represented by the target population on which parameter r is based, which in our case is the population of the Far North region, which represents 17% of the total population of Cameroon [15];
- \bar{n} is the average household size (number of persons per household) which is 5.1 persons per household in the Far North region [15];
- e the margin of error not to be exceeded, the value recommended by UN, (2010) is 10% of r.

$$n = (1.96^2)(r)(1 - r)(2)(0.05)/(0.17)(5.1)(0.1r)^2 \quad (2)$$

$$n = 44.309 (1 - r)/r \quad (3)$$

For $r = 5\%$ that is 0.05 $n = 841.87 \approx 842$ households

Thus the size of a representative sample for our study with a 95% confidence level and a 5% margin of error is 842 households. In order to improve this level of confidence and to reduce the margin of error as much as possible, 208 additional households were added to obtain a sample of 1050 households.

2.2.2 Sample distribution

Data collection was done using a 3-level stratified sampling. At the first level, the three departments (Mayo Kani, Mayo Sava and Mayo Tsanaga) were selected to be part of the study for the 06 departments of the region. At the second level, the 10 communes within the pre-selected departments were selected. At the third level, the villages located in the sub-selected communes were selected.

Since the sampling frame was not up to date, the teams conducted the household inventory in all the villages selected before household selection. Following this inventory, the sampling step was calculated according to the following formula:

$$P_i = \frac{N_i}{n_i}$$

With p_i : the survey step; N_i : the total number of households in the village and n_i : the number of households to be interviewed in the village in question.

For example, in one village, after surveying the first household randomly selected between 1 and the entire part of $[p_i]$, the sampling frame was applied to find the next households to be surveyed. In this way, the 20 households to be interviewed in each village were evenly distributed throughout the target locality.

2.3 Description of Latrines

The description of the latrines was based on the data collected during the household interview and the latrine visits. The interview was conducted with the heads of households or their spouses or their representatives and, to a lesser extent, with a child in the household over 15 years of age. This description focused on the type of latrine used, its characteristics and whether or not the population uses the latrine.

2.3.1 Case of households with a latrine

For households using a latrine, information was collected on the type of latrine (traditional, improved), its location within the concession, the estimated distances (in m) between the latrine and the house and the nearest water point, the date the latrine was built, the cost of construction, and the contractor. Subsequently, a visual description of the latrine was made by the data collection officer who visited it. At the end of this visit, information was collected on the components of the latrine, i.e. the pit, the slab, the superstructure or the enclosure and the roof, as well as the nature of the material used to build the enclosure and the slab.

Other information relating to accessibility, safety, comfort and the presence of a hand-washing device was obtained following this visit.

2.3.2 Households without a latrine

For households without latrines, information was collected on the location of defecation, frequency of defecation, and who defecates in the household.

2.4 Household Use of the latrine

The use of the latrine by household members was assessed through questions on whether or not they shared the latrine, cleaning the latrine (frequency, person in charge, method) and on the management of the device in case of filling (emptying or not, method of emptying, person in charge of emptying, becoming products extracted from the pit).

2.5 Data Analysis

The study data were tabulated using CSPRO version 6.1, processed in Excel spreadsheets and analyzed using R version 3.6. The assessment of the existence of a dependency between variables was done using the Chi-square test and the Chi-square residual test.

3. RESULTS AND DISCUSSION

3.1 Description of Excreta Management Systems

Data obtained from households show that the majority of them (92.5%) use latrines. Less than one-tenth of respondents (7.5%) practice open defecation. The ranking of the households

surveyed by commune shows that the proportions of latrine use vary from one commune to another (Table 1).

Specifically, a few municipalities stand out from the others with percentages of use ranging from 96-100%; this is the case in Kolofata, Mokolo, Koza, Soulédé-Roua and Mindif. Some communes, however, are still lagging behind with percentages below 90%. This is the case of Hina (89%), Moutourwa (86%), Kaélé (85%) and Tokombéré (85%).

The Chi-square test revealed the existence of a link between the rate of latrine use and the communes, with an overrepresentation of non-use of latrines in the communes of Tokombéré, Kaélé and Moutourwa.

The rate of latrine use (92.5%) is somewhat below the rate of access to latrines in Cameroon, which is 94% in 2015. However, it is still much higher than the latrine access rate in Sub-Saharan Africa (77%) and in developing countries (84%) [22]. The estimated open defecation rate of 7.5% is higher than the national value of 6% in 2015, but is still much lower than the values obtained both in Sub-Saharan Africa (23%) and in developing countries (16%) in 2015 [22].

The high proportions of non-use of latrines observed in some communes could be due to the absence or non-functioning of the communal hygiene service, whose role is to monitor, sensitize and support households in adopting good hygiene practices. But also to the insufficient or absence of support to households for the construction of latrines. Indeed, Nzouet et al. [23] and Temgoua et al. [24] found in similar studies in Cameroon that the cost of latrine construction is entirely the responsibility of the household. It is in the same spirit that the MINEE (Ministry of water and Energy) points out that the lower use of latrines in some localities in Cameroon is due to the lack of financial mechanisms to encourage households to build those [20]. Even more so because some household heads are unaware of the place and role of the latrine within the household.

3.1.1 Typology of latrines used and places of defecation

The majority of latrines used in the study area are considered traditional (made of local

materials) by their owners (Fig. 2). Only 16.9% of households use an improved latrine (built with a mix of local and imported materials). Non-latrine users indicate that their preferred places for defecation are brush, abandoned houses and riverbanks, with 67.9%, 17.9% and 14.1% respectively.

3.1.2 Latrine characteristics

The visit to the latrines revealed that all the latrines (100%) have a pit. The majority of them (92.1%) (Fig. 3A) have a superstructure. The materials used to build the superstructure vary from one latrine to another. The materials used are clay piled in the form of bricks, woven sheets or straws in the form of a tablecloth, and cinder blocks solidified with concrete, in percentages of 70.5%, 15%, 4% and 8.7% respectively (Fig. 3B). 85.6% of the latrines visited are covered by a slab (Fig. 3A). The materials used to construct these slabs are mostly wood (62.1%), earth (18.3%), reinforced concrete (15.8%) and to a lesser extent planks (3.9%) (Fig. 3C). Only small proportions (9.9%) of these latrines have a roof; built either with

straw mats (63.5%) or aluminum sheeting (36.5%) (Fig. 3D).

An analysis of the materials used for the construction of the latrines shows that they are mostly local materials. These results are similar to those obtained by [25], in Ghana. These authors noted during their study in the districts of Bole and Sawla-Tuna-Kalba that latrines were mostly built with local materials. This high proportion of use of local materials in the construction of latrines could be due to the context of the study area, which is predominantly rural, to the habits and preferences of the populations concerned, but also to the low purchasing power (financial poverty) of the households. This obliges them to use the materials present in their living environment. To this end, Nunbogu et al. [25] and Franceys et al. [26] mention that in addition to local geological and hydrogeological conditions, latrine construction techniques and methods depend on the household's financial capacity, the availability of construction materials at the local level, local culture and architecture, and the ingenuity of locally available artisanal masons.

Table 1. Proportion of latrine use by households according to the communes surveyed

	Municipalities investigated									
	Kolofata	Mokolo	Koza	Souldé-Roua	Mindif	Mora	Hina	Moutourwa	Kaélé	Tokombéré
Oui	100	98.2	97	96.7	96.2	92.9	88.9	86.2	85.3	85
Non	0	1.8	3	3.3	3.8	7.1	11.1	13.8	14.7	15

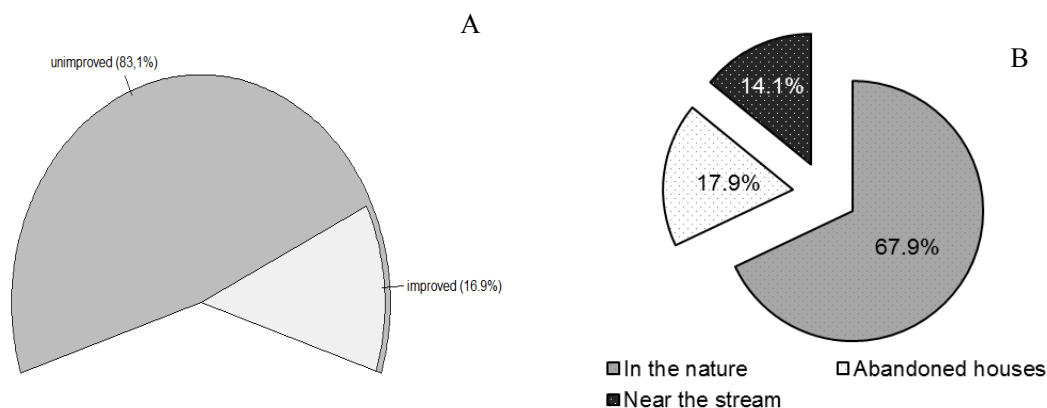
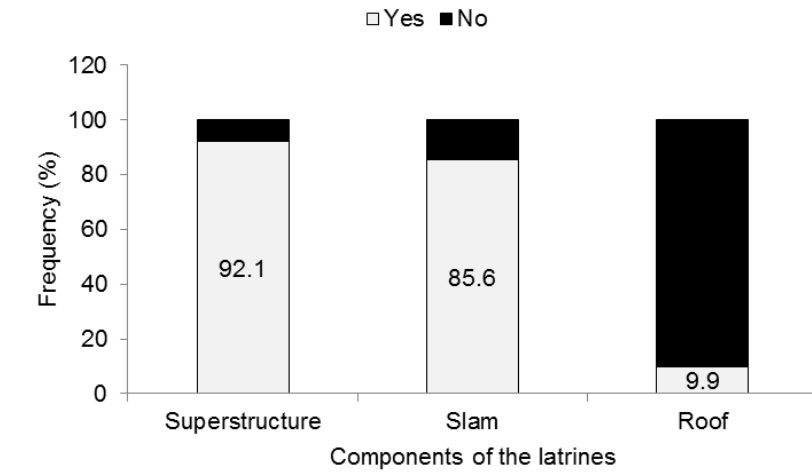
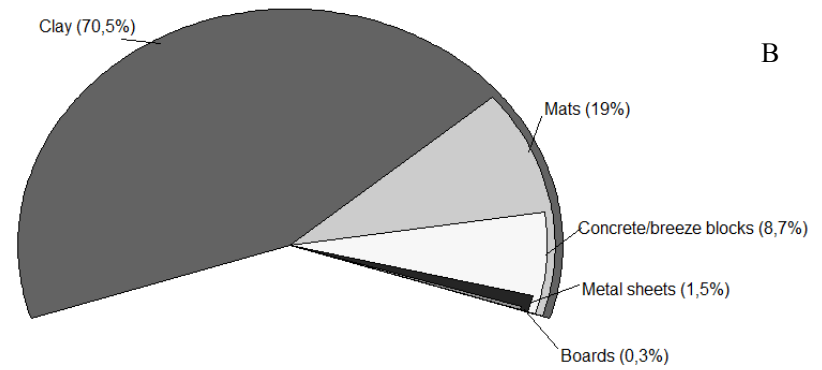


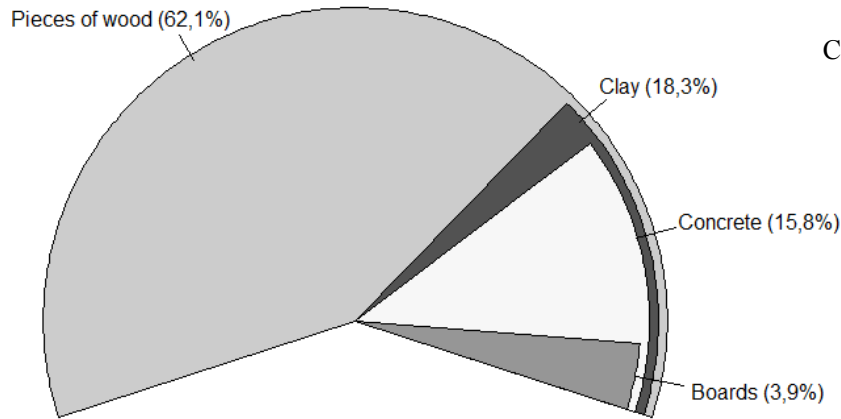
Fig. 2. Household proportions by type of toilet used (A) and proportions of defecation sites mentioned by non-latrine users (B)



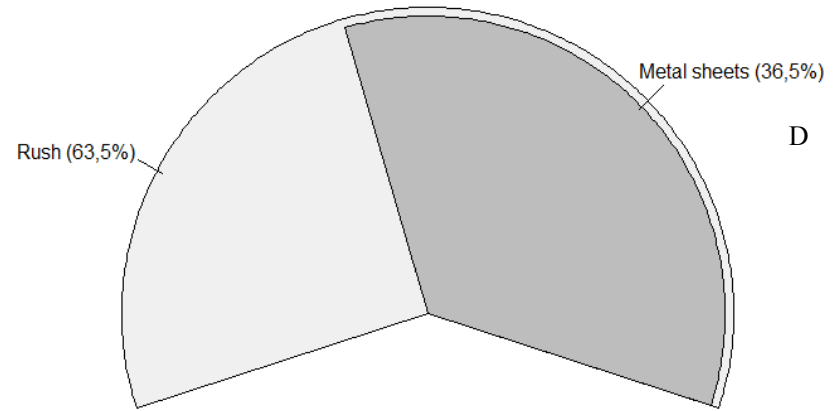
A



B



C



D

Fig. 3. Components of the latrines investigated and construction materials

A. Frequency graph B: Superstructure, C: Slab and D: Roof

The lack of uniformity of building material of latrine is indicative of the non-existence of a standard model of latrine at the communal level, but even more indicative of the lack of mastery of appropriate technologies and best practices for the design and construction of improved latrines by the artisans in charge of their construction at the local level [20].

The unfinished and unimproved nature of some latrines contributes to the exposure of users' privacy, increased risk of falling, and vulnerability to bad weather (rain, sun, sandstorms, etc.). All these shortcomings could be one of the causes of their lesser use, especially for women and girls, because the degree of finishing of the latrine impacts on its use. Indeed Nunbogu et al [25]; Barnard et al [13], have found that protection against bad weather (presence of the roof on the latrine) and privacy (presence of the superstructure + door) contribute significantly to the use of latrines within households. Moreover, these latrines are sources of fecal contamination for humans and their environment.

3.2 Management of the Latrine

3.2.1 Latrine maintenance

Most of the households interviewed (93.3%) said they clean their latrine. In terms of latrine cleaning, the communes of Souldé-Roua, Koza,

Mindif, Tokombéré, Mora and Kolofata stand out from the others with latrine cleaning frequencies above 95% (Fig. 4). However, the commune of Hina is totally different from the others with a frequency of not cleaning the latrine of more than 40%. This difference can be observed through the Chi2 test ($p\text{-value} < 2.2 \times 10^{-16}$). Cleaning frequencies range from 1 day per week to 7 days per week. The proportions obtained are 48.6%; 7.3; 25.7% and 17.2% respectively for households that clean their latrine every day, 4 days, 3 days and 1 day per week (Fig. 5A). However, some households (1.2%) reported cleaning their latrine only when needed. Maintenance is done either by simply sweeping the latrine or by washing with water or more with water and detergent in percentages of 87.3%, 6.6% and 6.1% respectively (Fig. 5B). This cleaning is mostly done (65.7%) by the spouse of the household head, with only 17.2%, 12.7% and 4.3% of households reporting that it is done by the children, the household head or an employee respectively (Fig. 5C).

Despite the fact that nearly 50% of households carry out maintenance of their latrine, more than 90% of them do so in a basic manner. This approach is not appropriate for hygienic sanitation, as it goes against the requirement of [2] that latrine cleaning be done not only on a daily basis, but also with water and detergent.

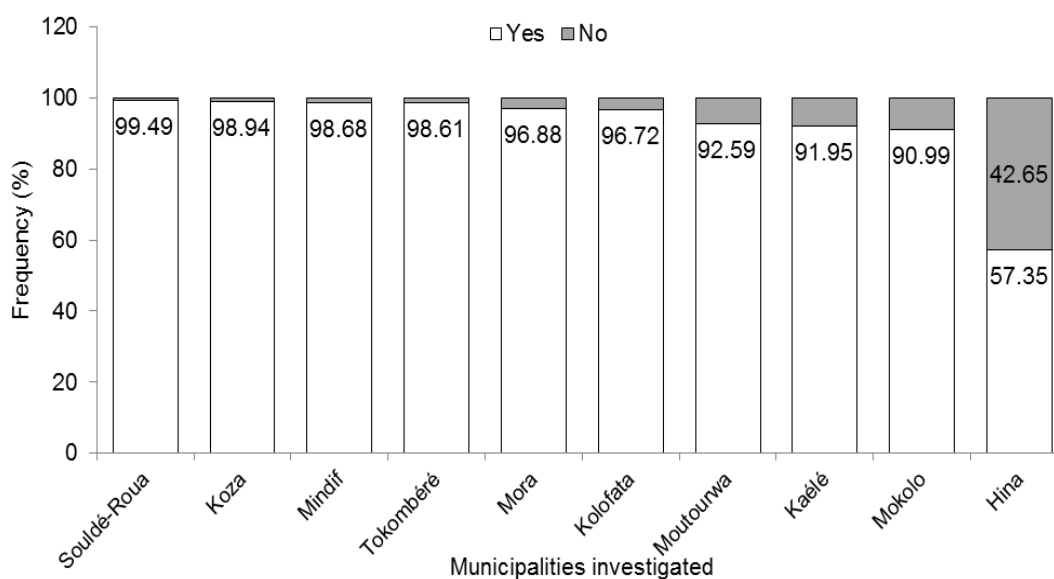


Fig. 4. Proportion of households cleaning their latrine according to the communes surveyed

The study also revealed that latrine cleaning is mostly done by women or children. These results are similar to those obtained by Nzouetet et al [23] and Nunbogu et al [25] who reported in their studies that women do the majority of latrine cleaning and girls.

The lower use of water and detergent during latrine maintenance could be explained by the environmental, economic and social constraints under which the populations of these localities are burdened. From an environmental point of view, the localities investigated are located in a sub-Saharan transition zone characterized by a Sudano-Sahelian climate with low rainfall, high levels of sunshine and high temperatures. This results in the periodic drying up of rivers and streams and the lowering of the water table. All of this contributes to the reduction of access to water by the populations of these localities and, consequently, to its lesser use during latrine maintenance. Economically, the Far North region is one of the regions of Cameroon where the household economy is almost 90% based on agriculture. However, this agriculture is dependent on the climatic conditions and the isolation of localities. The direct consequence is the financial poverty of households. This limits their ability to purchase manufactured products such as soaps and detergents, and therefore their use in the maintenance of latrines. At the social level, the low level of education of household heads is an obstacle to understanding the benefits of proper latrine cleaning for household members.

3.2.2 Toilet emptying

The study found that only an average of 15% of households have emptied the pit of their current latrine. Out of the 10 communes surveyed, 7 of them have a lower percentage of emptied latrines than this average (Table 2). These are the communes of Kolofata, Tokombéré, Koza, Mora, Moutourwa, Kaélé and Mindif. However, the communes of Mokolo and Souldé-Roua and Hina with percentages of 22.52%, 29.73% and 52.78% respectively are well above the average obtained.

Only 27.5% of households have already emptied the pit of their latrine, the rest of households have not had to empty their pit (72.5%) or do not know if their latrine has been emptied. The finding that the majority of households have not had to empty their pit would be due to the fact that when pits are filled, households are more likely to opt for the construction of another latrine (61.4%) instead of emptying their pit (13.5%). For

households that had already emptied their pit, this was done either by a household member (67.6%) or by a male attendant (32.4%). The sludge extracted from the pits is either buried in a pit located inside (15.9%) or outside the concession (11.9%), or discharged directly into the wild (6%), or used for agricultural amendment production (60.3%).

The finding that the majority of households have not emptied their latrine is due to the juvenile state of the majority of these latrines - more than half of them are less than 5 years old.

The choice not to empty a latrine could be explained by the ease with which households can dig a pit compared to emptying a pit, which is dependent on the presence of a manual or mechanical emptying service, funds representing the costs of the service, but also nuisances (bad odor, fly proliferation) and environmental and health risks. Prüss-Üstün et al [3] Luby et al [27] indicate that inadequate management of fecal sludge combined with insufficient hygiene are the main causes of geo-helminthes, trachoma, nematode infections, diarrhea and cholera. The way in which pits are managed after filling is similar to that observed in the majority of rural and peri-urban areas of Cameroonian towns and cities, as noted [24]. Indeed, these authors working on WASP projects in the town of Dschang, found that when the pits are full, the inhabitants close them and dig a new pit. This situation, which prevails in the majority of the localities investigated, is due to the absence of an emptying service or its non-functioning.

Whether it is the production of soil improvers, burial or discharge into the environment, the way sludge is managed after the pits are emptied presents a real health risk for the population, but even more so for the environment receiving the sludge. Indeed, OMS [2] states that the inappropriate management of faecal sludge presents a major risk for the environment because it contributes to the contamination of groundwater and surface water through the processes of infiltration, percolation and flow of the pollutants (organic, inorganic and microbiological) it contains. And to soil pollution and its harmful effects on soil microorganisms because of its high content of heavy metals. But even more explode the populations at risk of waterborne diseases as was the case in 2010 with the cholera epidemics that killed several dozen people in the Far North region. However, these ancient pits remain buried, are a source of pollution for the water table.

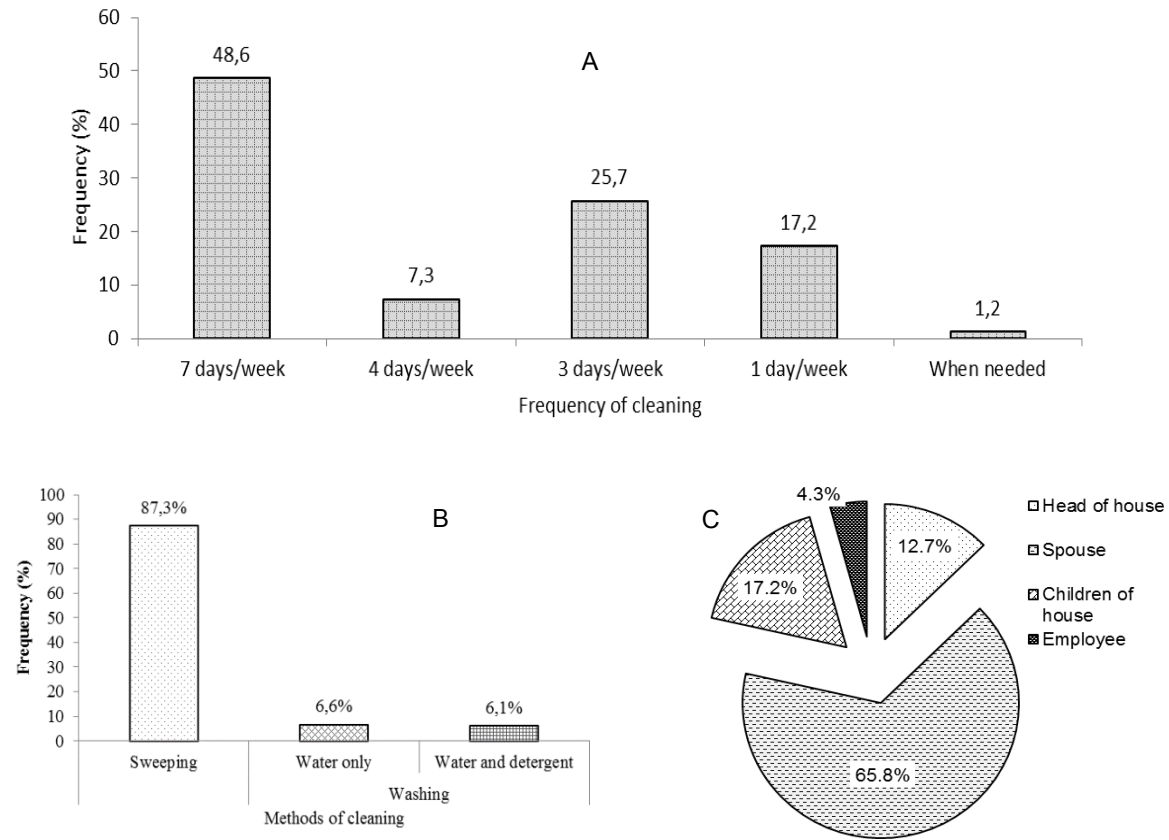


Fig. 5. Cleaning of the latrine

A: Proportion of different frequencies of cleaning, B: Proportion of using method of cleaning, C: Proportion of person in charge of cleaning

Table 2. Emptying status of the pits according to the municipalities investigated

	Municipalities investigated									
	Kolofata	Tokombéré	Koza	Mora	Moutourwa	Kaélé	Mindif	Mokolo	Souldé-Roua	Hina
DN	0	44.54	3.13	12.98	30.43	0	1.3	1.8	11.49	4.17
No	96.72	51.26	90.63	80.15	62.32	91.95	87.01	75.68	58.78	43.06
Yes	3.28	4.2	6.25	6.87	7.25	8.05	11.69	22.52	29.73	52.78

4. CONCLUSION

A study was conducted with the aim of providing the baseline situation of latrine use in the Far North and thus marks the starting point for any intervention to improve the situation of latrine access in this region. This was done through an evaluation of the type of device, as well as their level of use by households in the Far-North region. The study found that the majority of households use latrines. However, these latrines are mostly unimproved. Open defecation is still practiced in some localities. This method of fecal management exposes the population to intestinal, skin and eye infections that have a negative impact on the community's economy, health and productivity. For this reason, we encourage those who use unimproved facilities to improve them, using hygienic separation of feces as the main criterion. The practitioner of open defecation is advised to stop this harmful practice.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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