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Assessment Of Waste Management Practices In Confined Horse-Breeding Properties

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Abstract:

Background: *Intensive horse breeding in Rio Grande do Sul involves various operational aspects, including waste management practices, which are crucial for environmental sustainability. Effective waste management not only ensures regulatory compliance but also mitigates environmental pollution risks. However, the adequacy of waste management practices in this context remains unclear.*

Materials and Methods: *This research conducted 88 interviews with managers and owners of horse breeding establishments across 51 municipalities in Rio Grande do Sul. Each facility surveyed housed a minimum of 11 stabled horses. The interviews were structured into two parts. The first segment gathered zootechnical data related to environmental sanitation, encompassing management practices and adherence to environmental regulations. The second segment specifically delved into waste management practices.*

Results: *Findings revealed significant deficiencies in waste management practices, particularly concerning healthcare waste. The inadequacies were primarily attributed to respondents' limited understanding of proper waste management protocols and insufficient institutional support, influenced by cultural, bureaucratic, and economic factors. Moreover, a notable portion of establishments neglected organic agricultural waste treatment measures, although some repurposed such residues as fertilizer.*

Conclusion*: The study concludes that establishments engaged in intensive horse breeding in Rio Grande do Sul generally lack effective waste management procedures. This deficiency stems from a collective misunderstanding of waste management principles among stakeholders, resulting in the adoption of suboptimal measures. Urgent interventions are warranted to enhance awareness and enforcement of proper waste management practices in this sector.*

Key Word: *Intensive horse breeding; Waste management practice; Environmental sustainability; Healthcare waste managemen; Organic agricultural waste.*

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I. Introduction

Over the years, researchers have progressively studied the aspects involved in operationalizing and improving sustainability in the most diverse areas. The current scenario requires greater preservation of natural resources, which is one of the boosters related to concern about the topic. The social and economic perspectives that involve sustainability must also be considered.

Associated with these problems presented, as a result of the various agricultural and livestock activities, the production of waste, which regardless of its origin, is a challenge to be solved.

Highlighted global trends that show an increasing number of stables and horses located close to cities, increasing international concern about the environmental impacts of equine manure management. Places such as equestrian centers, hippodromes and cavalry regiments, often located in large urban centers, do not have an adequate resources or physical spaces for efficient waste treatment (Airaksinen, 2006).

Environmental sustainability plays an important role in the social acceptance of horse breeders and livestock farmers (Deutscher, 2020). A sustainable approach involves both global and regional actions (Siebrecht, 2020). The transfer of horses from extensive natural areas to confined spaces has resulted in negative environmental impacts (Shere, 2012). This sparked international interest in the environmental impacts that the management of equine waste can cause (Airaksinen, 2006).

Although the amount of waste produced by agribusiness compared to that generated by industrial activity is relatively low, the potential for long-term pollution is high. As animal waste contains organic matter and potentially pathogenic agents, the risk of contaminating surface and groundwater due to inadequate disposal of this waste into the soil can be significant (Sarmah, 2009).

Excess of nitrogen is one of the main environmental challenges in horse breeding (Buchgraber, Braach, & Münsch, 2011). Inadequate disposal of waste generated by this activity also causes problems such as groundwater contamination, attraction of urban pests and aesthetic degradation of the environment (Fujii et al., 2014).

Despite the environmental impacts that horse farming can cause, the implementation of ecologically correct practices faces resistance from producers who consider horse manure as a fertilizer for the soil, considering its treatment unnecessary and financially unattractive (Kunz & Encarnação, 2006). However, to be effective managers of their activities, horse breeders must prioritize good waste management practices, promoting environmental sustainability (Westendorf, 2013).

Effective management requires information about production, storage and use (Rutgers, 2017). As not all waste can be reused, the importance of proper disposal is emphasized due to its potential for environmental contamination and the risks associated with animals and humans.

Specifically in the equine farming sector, the issue is still little discussed and studied, despite the sector contributing significantly to the development of Brazil.

Brazil is one of the main players in the equine industry, boasting the fourth largest equine population in the world and a valued equestrian culture that has not yet been officially recognized as heritage (Adelman, 2020).

In April 2015, the income generated by equine farming in the country totaled R$ 16.15 billion, compared to R$ 7.5 billion in 2006. This growth is justified by the dynamics of recent years, with a significant increase in the breeding of horses aimed at to the urban public (leisure and sport) (Lima & Cintra, 2016).

Despite the horse's notable global prominence, its role within Brazilian Agribusiness remains relatively unknown, especially about to its substantial contribution to income generation and job creation. Often, industry perceptions are distorted and clouded by bias. Many people see the equine industry as serving exclusively the interests of an elite class, disconnected from the reality of the average Brazilian (Lima, Shirota, & Barros, 2006).

By April 2015, revenue from horse breeding in Brazil reached R$16.15 billion, a significant increase from R$7.5 billion in 2006. This growth is attributed to recent changes, including an increase in horse breeding. of horses for urban purposes, such as leisure and sports. Moreover, the sector accounted for 610 thousand direct jobs and 2,430 thousand indirect jobs in Brazil (Lima & Cintra, 2016).

The Brazilian equine herd is made up of 5,834,544 animals (IBGE, 2022), distributed across 1,170,696 establishments (IBGE, 2017). In the state of Rio Grande do Sul, Brazil, alone, there are 492,396 animals, making it one of the largest producers, along with Minas Gerais (IBGE, 2022).

In Rio Grande do Sul, state of South Brazil, equine farming also has a fundamental importance in economic development, where the use of these animals is associated with rural activities and closely linked to the state's culture and traditions.

Confined equine farming, like any other agricultural activity, inevitably generates waste, and consequently, has the potential for environmental degradation, such as contamination of groundwater and surface water, attraction of flies or other animals, in addition to bad smells.

Equines subjected to the extensive system produce mainly feces and urine, and, normally, there is no significant concern with the destination of this waste, since it concentrates directly in the soil, resulting in an uncontrolled decomposition of organic matter. With confinement, other waste appears, such as the bedding used in the facilities.

Furthermore the waste mentioned, there are also unused food remains. The remains of syringes, needles, medicines, placentas, hair and hooves are also added. When the waste produced by an activity is not managed properly, it leads to environmental impacts, which affects not only environmental health, but also human health. In this sense, the concern with the appropriate destination and treatment of this waste becomes even more relevant.

For equine farmers to be good managers of their activity, it is essential that they adopt good practices. With this aim, this research tried to identify and characterize the waste generated by confined equine farming activities in the state of Rio Grande do Sul, Brazil, as well as to understand the management adopted by equine farmers in their establishments regarding the management of organic waste and waste from health services, in addition to identifying failures in the waste management process.

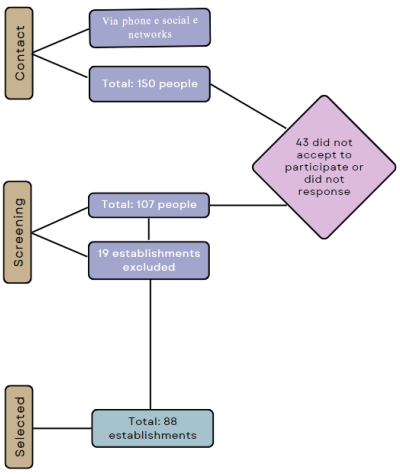
II. Material And Methods

To conduct this research, interviews were conducted in state of the Rio Grande do Sul, Brazil, with managers/owners of establishments with confined equine farming. The study covered a total of 51 municipalities. This value does not reflect the number of interviews carried out, since, in some cases, more than one interview was carried out in the same municipality, although not in the same establishment.

The minimum number of horses stabled to qualify for this research was eleven animals. This criterion was based on findings by Costa et al. (2014), who reported that 92% of properties with horses declared in Rio Grande do Sul owned up to 10 horses. Furthermore, a significant number of horses are needed for the volume of waste generated to be considered a problem.

In the sampling calculation, the formula suggested by Gil (1999) for infinite populations has been applied. The determined value for achieving a significant sample size was 88 interviews. To reach this target, 150 individuals were contacted, out of which 43 declined to participate or failed to respond to contact attempts, and 19 did not meet the established criteria. The interviews were conducted based on the availability and interest of equine farmers in participating. The selection process for interviewees is outlined in Figure no 1.

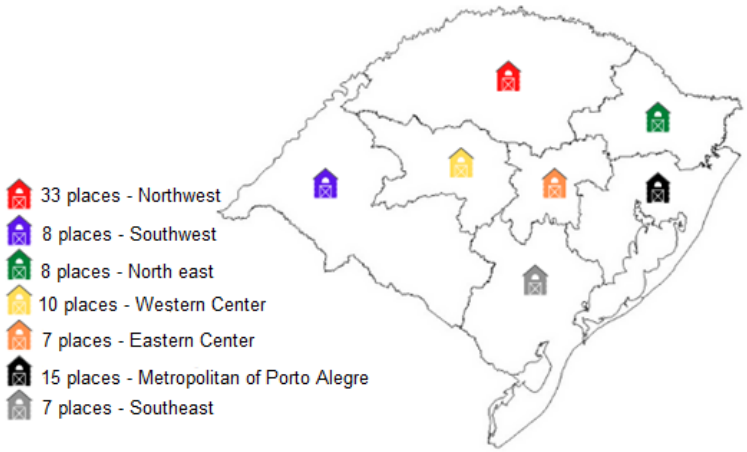
Figure no 1: Flowchart of the steps for screening and selecting establishments participating in the research.



Source: Prepared by the authors.

Figure no 2 shows the distribution by mesoregion in Rio Grande do Sul of participating establishments. Samples by mesoregion were not calculated due to the lack of data regarding the number of horses confined for each region.

Figure no 2: Distribution by mesoregion of establishments with confined equine farming participating in the research.



Source: Prepared by the authors.

The interviews were carried out in person through visits and through an instant messaging and voice call smartphone application. To facilitate organization and analysis, each interview was divided into two parts.

The first part focused on zootechnical aspects related to environmental sanitation, including the adopted zootechnical management practices and compliance with current environmental legislation. The second part addressed waste management, seeking to understand the types of waste generated, how they were stored, treated, reused, and disposed of. Additionally, the level of knowledge of the interviewees on waste management was assessed. In cases where deficiencies in good management practices were identified, interviewees were asked about the reasons for not implementing appropriate procedures. The legislations or regulations considered in this study were those belonging to Brazil.

To estimate the amount of bedding waste generated by establishments, only the density of sawdust was used, ignoring wood shavings, as few establishments used this material. The average value of the bulk density of sawdust from the lumber used was 216 kg/m³, as established by Hillig, Schneider and Parroni (2009). For rice husk, the density used was 130 kg/m³ (Mayer, Hoffmann, & Ruppenthal, 2006).

To assess the volume of bedding materials produced in the sample studied, four bags of sawdust and four bags of rice husk from different sources were weighed, and the average value of the weight of the four bags of each of the raw materials was then considered. The average weight of the materials was 31 kg for sawdust and 13 kg for rice husk. To calculate the amount of waste generated (feces and urine), as used in the research by Colatto and Langer (2006) and Catapan et al. (2011), the value of 10 kg of waste per day per animal was used, stipulated by Barrera (1993).

The results were presented descriptively, providing incidences, percentages, and other measures to describe waste management practices in confined equine farming establishments. Additionally, the data were tabulated to facilitate organization and analysis.

This study was approved by the ethics committee for research involving human subjects in Brazil. Participant confidentiality was maintained, with all participants providing informed consent for their participation in the research.

III. Result and Discussion

The materials mentioned by the interviewees for lining the stalls were: sawdust, wood shavings, rice husks and rubber mats. Sawdust was reported as the lining material in 40 locations, with rice husks being observed in the same number of establishments. Wood shavings were utilized on six properties, which, according to Cintra (2010), are considered one of the best bedding options for horses. One owner mentioned using both wood shavings and sawdust. Interestingly, only one interviewee reported using rubber mats (Table no 1).

Table no 1: Bedding materials and their occurrence in establishments in Rio Grande do Sul.

Substrate	Occurrences on properties at the state level
Sawdust	40 (45,45%)
Wood Shavings	6 (6,82%)
Sawdust/Wood Shavings	1 (1,14%)
Rice Hulls	40 (45,45%)
Rubber mat	1 (1,14%)

Source: Prepared by the authors.

When producers were asked about the difference between wood shavings and sawdust substrates (this difference was not clarified during questioning), equine farmers were unable to distinguish between them accurately. As explained by Carrijo et al. (2004), wood shavings consist of larger wood particles obtained from wood planing, whereas sawdust comprises finer wood particles obtained from wood milling.

During site visits, bedding composed of wood by-products exhibited non-uniform characteristics, with a mixture of wood shavings and sawdust present. It is important to note that several owners expressed a preference for sawdust over wood shavings because, according to the interviewees, sawdust can be sifted, thereby minimizing waste.

Regarding the volume of litter generated, for sawdust, considering its density and the weight of a bag of this material, along with the number of bags consumed at the time of data collection, a total of 7621 bags were used, resulting in 236251 kg of sawdust, equivalent to a total volume of 1904 m³ of litter. Similarly, for rice husks, 8292 bags were recorded, generating 107796 kg of waste, with a volume of 829 m³.

Due to the lack of standardized litter management, it was not possible to estimate the annual amount of litter material accurately from the samples collected. This estimate only considers the litter substrate present at the time of data collection.

Referring to the compliance of establishments with regulations regarding distances from surface waters (Table no 2), concerning construction works, which in this study refers to the location where horses are stabled, such as springs and water sources, most locations appear to comply with Law No. 12,651 of the Forest Code, which establishes a minimum radius of 50 meters. Only five locations were found to have distances shorter than that established by legislation.

Table no 2: Municipalities in which establishments had the presence of one or more surface waters and their distances according to interviewees

Distances in meters				
Regions of Rio Grande do Sul				
Northwest				
Cities	**Source**	**River**	**Waterhole**	**Lake/Pond**
Augusto Pestana	70	-	-	-
Campos Borges	-	5000	-	-
Espumoso	-	-	100	-
Ijuí	-	100	100	-
Ijuí	20	3000	-	-
Ijuí	3000	-	-	-
Palmeira das Missões	15	-	-	-
Palmeira das Missões	50	3000	-	-
Palmeira das Missões	20	-	-	-
Palmeira das Missões	-	-	20	-
Passo Fundo	-	-	-	4000
Passo Fundo	-	-	-	1000
Redentora	-	-	800	-
Santo Augusto	100	-	-	-
Santo Augusto	200	-	-	-
Santo Ângelo	100	-	-	-
São Valério do Sul	60	-	-	-
Sarandi	-	70	-	-
Tapera	3000		-	-
Três de Maio	400	-	-	-
North East region				
Bom Jesus	400	-	-	-
Cambará do Sul	600	-	-	-
Vacaria	400	-	-	-
Midwestern				
Júlio de Castilhos	-	-	300	-
São Sepé	200	-	-	-
Santiago	-	-	400	-
Santiago	-	-	500	-
Central-Easter				
Cachoeira do Sul	-	1500	-	-
Metropolitan Region of Porto Alegre				
Capão da Canoa	-	300	-	-
Glorinha	-	-	200	-
Gramado	-	-	-	30
São Leopoldo	-	-	120	-
Torres	-	-	-	4000
Southwest				
São Borja	-	400	-	-
Uruguaiana	-	-	-	1000
Uruguaiana	40	-	-	-
Southeast				
Caçapava do Sul	200	-	-	-
Caçapava doSul	600	-	-	-
Pinheiro Machado	-	-	-	200

Source: Prepared by the authors.

Regarding natural lakes/ponds and rivers, the distances specified by Law No. 12,651 vary based on the size of these water bodies. None of the interviewees could provide precise dimensions, although they had a general understanding. For rivers, the minimum distance is 30 meters and can reach 500 meters for watercourses wider than 600 meters (Law No. 12,651, 2012). Despite this, according to the interviewees' answers, four locations had a distance greater than the greatest minimum distance required by legislation, which allows us to conclude, based on the answers, that they are adequate. In relation to natural lakes/ponds, still in accordance with the same law, the minimum range is 100 meters for rural areas (water body with up to 20 hectares the distance must be 50 meters and 30 meters for urban areas). In this way, they were all configured as adequate. Therefore, most properties respect the conditions regarding distance determined by legislation (Law No. 12,651, 2012).

None of the owners or managers reported making eco-efficient purchases. All interviewees claimed to be unfamiliar with the concept. Despite this, there are sustainable cosmetics for horses on the market, which is, therefore, an alternative to contribute to the sustainability of the ecosystem. Likewise, none of the properties reused water to clean the stalls. This can be justified by the fact that most of the stables had dirt floors, which did not allow the use of water for cleaning. However, reusing water is an alternative for sustainable cleaning of stalls, as it does not require potable water for washing. When managing stable cleaning, some owners and/or managers mentioned the use of pulverized creolin and/or calcium hydroxide Ca(OH)2 in areas where there is greater accumulation of urine.

It is known that the quality of the drinking water source for animals is extremely important. When respondents were asked about the frequency of microbiological water analysis, in 60 locations it was never carried out. Fourteen interviewees responded that the analysis was carried out annually. Eight breeders reported that the analysis was performed only once. Twice, four interviewees discussed this. The remaining two stated that this analysis had already been carried out, but were unable to inform the frequency (Freitas & Almeida, 1998; Willms et al., 2002; Freitas, Brilhante, & Almeida, 2001; Dozzo, 2011).

Regarding the disposal of water used for bathing animals, forty-three establishments had a septic tank for this purpose. Secondly, the most frequent destination option was the “soil”, with twenty-three responses, indicating that the interviewees did not mention a specific form of disposal, suggesting that the water was absorbed by the soil in an open area where the water was bathed. animals was carried out. Additionally, the lawn or patio were also mentioned as destinations, but all of these cases were included in the “ground” category. In ten establishments, the water used for bathing was piped to the pasture paddocks; six mentioned sewage as a destination, two mentioned a deactivated dam, while crops, lagoons, treatment wells and streams were mentioned once each as destinations.

Interviewees were asked about environmental licensing for their enterprises. Out of the 88 respondents, only 15 reported having such licensing. Thirteen of them were involved in beef cattle production, either solely or in conjunction with other agricultural activities. The remaining two respondents were engaged in soybean production and exclusive equine farming, respectively.

Waste management

Regarding waste management, Table no 3 presents the waste produced and the number of generating establishments.

Table no 3: Waste produced and the number of generating establishments in the state

Healthcare waste	**Number of generating establishments**
Used syringes and needles	88 (100%)
Empty medicine bottles	88 (100%)
Unused drugs to be discarded	56 (63,64%)
Used gloves	83 (94,32%)
Gauze/cotton used	81 (92,05%)
Agricultural waste	**Number of generating establishments**
Beds	87 (98,86%)
Food scraps	80 (90,91%)
Feces/urine	88 (100%)
Hoof remains	88 (100%)
Bristle	87 (98,86%)
Placenta	39 (44,32%)
Dead animals	62 (70,45%)

Source: Prepared by the authors.

All establishments generated used syringes, needles, and empty medicine bottles. Gloves and gauze/cotton appeared with 83 and 81 occurrences, respectively. Although with lower incidence, still indicating more than half of the establishments, 56 locations disposed of unused medicines, demonstrating a significant number of occurrences regarding the generation of healthcare waste in confined equine farming. However, it was not possible to draw conclusions regarding the specific quantity generated for each type of waste. Table no 4 presents the methods used for packaging healthcare waste.

Table no 4: Packaging of the waste generated in establishments

Storage of health-care waste	Number of properties
Plastic Bag	22 (25%)
Pet bottles and plastic bags	20 (22,73)
Specific box to health care waste	14 (15,91%)
Not stored	12 (13,64%)
Ordinary cardboard boxes	8 (9,09%)
Glass jars and plastic bags	3 (3,41%)
Piled up waste	3 (3,41%)
Ordinary cardboard boxes and plastic bags	2 (2,27%)
Feed bags	2 (2,27%)
Pet bottles and ordinary cardboard boxes	2 (2,27%)

Source: Prepared by the authors.

Establishments that utilized multiple forms of storage did so primarily to provide better mechanical protection for needles, using containers such as PET bottles, glass jars, and cardboard boxes. Among the 22 establishments that employed plastic bags, twelve indicated that they placed the needles inside the syringes. Thus, although 74 locations do not utilize the containers recommended by Brazilian legislation for healthcare waste storage, there is a clear concern for protection to prevent possible injuries from needle punctures during waste collection.

None of the establishments utilized the white bags recommended for packaging infectious waste, as outlined in RDC ANVISA No. 228/18. This category encompasses items such as dressings, gauze, cotton, or materials soiled with blood.

Twelve interviewees mentioned that they do not store waste on-site. This is because such waste is not specifically generated by the property, although it is where the waste originates. Consequently, the responsibility for storage and disposal lies with the veterinarian, who manages this waste accordingly

As shown in Table 5, while there is evident concern for the protection of needles generated on properties, only twenty-one establishments showed concern for the appropriate disposal of healthcare waste. This involved either using a designated collection point, utilizing a specialized collection service for this type of waste, or delivering it to the municipal health department.

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Table no 5: Final destination of the waste generated in establishments

Final destination	Number of properties
Common Trash	49 (55,68%)
Collection Point	14 (15,91%)
The vet disposes of the waste	12 (13,64%)
Special collection service	5 (5,68%)
Incinerated	4 (4,54%)
Health surveillance	2 (2,27%)

Chemical waste bin	1 (1,14%)
In a hole in the property	1 (1,14%)

Source: Prepared by the authors.

Four owners reported incinerating health care waste generated on their property, which is not recommended. This incineration, when carried out inappropriately, results in the release of pollutants into the air and the generation of waste in the form of ash (World Health Organization [WHO], 2018). This differs from incineration done properly. This method, according to Eleutério, Hamada, and Padim (2008), burns waste at temperatures above 1,000ºC. The gases arising from this burning are also raised to high temperatures so that the dioxin and furan molecules disintegrate, resulting in the reduction in weight and volume of the waste through controlled combustion in Multiple Chamber Thermal Treatment equipment.

Burying healthcare waste is also not the appropriate final destination, with one occurrence found. Regarding the final destination of Healthcare Waste carried out by Veterinarians, the interviewees were unable to inform which destination was provided by the professionals. Therefore, they were not accounted for, due to uncertainties. The most frequently cited destination was the common trash bin, with collection carried out by the municipal collection service for household waste.

In the case of healthcare establishments, in a survey carried out on the management of hazardous waste in Danka, Bangladesh, it was found that hazardous waste was dumped in boxes in the city and discarded in general landfills, exposing waste pickers to this waste. Furthermore, the potential for groundwater contamination was noted, as the landfills were located in areas subject to frequent flooding. There is also a risk for the general population who may come into contact with these dangerous wastes when dispersed in an inappropriate environment (Patwary, O'Hare, & Sarker, 2011). Furthermore, because landfills have been inadequately constructed, the disposal of untreated healthcare waste in these locations can lead to the contamination of drinking, surface, and groundwater (WHO, 2018).

As for organic waste, all establishments generated feces, urine and hair residues. Regarding the destination of waste (feces and urine), 84 interviewees mentioned using them as organic fertilizer, either on their own properties or donating them to other people who also used them as fertilizer. Four interviewees mentioned two different disposal methods: common waste and donation, totaling 88 properties.

Concerning waste storage, fifty-eight interviewees mentioned depositing it in an open pile. Furthermore, 19 interviewees stated that they did not store waste anywhere; instead, they used them to fertilize immediately after cleaning the stalls. Six people reported having a compost bin. An informant directed the waste to a manure pile without controlled composting. Three interviewees stored waste in bags, and one owner mentioned having a pit where waste was deposited after cleaning the stalls. It is worth mentioning that rubber mats were used in this property, allowing the floor to be washed with water.

Of the 88 interviewees, almost all (82) mentioned that they did not compost waste. The reasons given for this were: lack of time, shortage of labor, lack of knowledge to adopt the procedure on the property, lack of interest and lack of need to treat organic waste, as it was used as fertilizer.

Regarding what was done with the remains of horse hair, the majority of those interviewed (61) said they discarded it as garbage. Seventeen people mentioned collecting these remains with feces and urine, to be used later on the property. Four reported that they deposited the remains of hair in the compost bin. There was only mention of other forms of disposal: depositing directly into the soil as organic fertilizer, incinerating, burying and donating (to be used in the manufacture of brushes). Finally, two interviewees said that the remains of horse hair were mixed with waste for later donation. In short, all properties generated hair residues.

In the case of waste from animal hooves, 66 interviewees mentioned that they discarded it as common garbage, with three of them stating that part of this waste was ingested by dogs. Seventeen interviewees mentioned piling this waste in the open along with other waste. With one occurrence each, three different destinations were mentioned: composting, direct deposit into the soil to fertilize the property and incineration. Two interviewees reported that they did not generate this type of waste. Therefore, it is concluded that 86 establishments generated hoof waste.

There were several ways reported to dispose of the horses' food remains, with different frequencies: 41 responses indicated accumulating these remains outdoors together with waste or using them as fertilizer on the property; 15 interviewees mentioned using the remains directly as fertilizer on the property immediately after collecting them; three people reported using these remains in the compost bin and, after treatment, using them as fertilizer on the property; three other individuals mentioned hoarding the remains with the waste and then donating them. Two informants said they discarded it in the trash; and, finally, destinations mentioned only once included the use of manure for fertilization on the property, feed for cattle, storage in bags and subsequent donation. In total, 21 interviewees stated that there was no this type of waste on site.

In the same way as food waste, the majority (50 interviewees) stated that they deposit leftover litter in the open air for use as fertilizer on the property. One owner mentioned using a storage place, a manure pit, without treating the material, and then using it as organic fertilizer on his own property.

Furthermore, 26 interviewees stated that they do not store leftover bedding; they deposited them directly on the ground immediately after removing food waste from the facilities. Only six interviewees used a compost bin to treat this waste, transforming it into fertilizer for use on the property. Two informants mentioned piling up leftover bedding outdoors along with waste to use as organic fertilizer. Other methods mentioned included storage in bags with the waste for later donation, disposal in common trash and one producer stated that he did not generate this type of waste on site. It was concluded that 87 locations produced bedding waste.

Regarding placental remains and/or dead animals, of the total interviewees, 24 mentioned burying dead animals, with no reports of placental remains. Of the places where both wastes occurred, 26 interviewees reported burying them. Although two of these sites also buried dead horses, in the case of placenta remains, these residues were ingested by dogs on the properties. Seven respondents mentioned burying the animals in case of death, but the placentas were left in the field, that is, deposited in the middle of the bush. Furthermore, two interviewees stated that they only generated the placenta, which was buried. In two cases, both dead animals and placentas were left in the field to decompose. One owner even reported removing the animals' bones and donating them to a university. Finally, one interviewee mentioned that only dead animals were incinerated. Therefore, the destinations mentioned for dead animals and/or placenta were: burial, leaving in the field, incineration and ingestion by dogs (in the case of the placenta). Thus, 64 properties dealt with placenta and/or dead animals.

Disposing of animals in ditches or in the bush not only generates bad smells but also attracts and can even breed a large number of blowflies. The use of septic tanks, as well as the habit of burying carcasses, can contaminate the water table. Furthermore, incineration results in a high environmental cost due to the mineralization of organic matter (transformation into ash) and the emission of harmful gases, especially when diesel oil is used as fuel (Paiva, 2009).

From a biosafety point of view, carcass disposal requires great responsibility on the part of the professionals involved. Every carcass, regardless of whether or not it is contaminated by pathogenic agents, is considered solid waste (Cardoso, 2002).

As an alternative for producers to deal with animal carcasses, composting is an economical and environmentally sound method. When carried out correctly, it does not cause air or water pollution, avoids unpleasant odors, destroys disease-causing agents, and produces an organic compound that can be used in the soil, recycling nutrients (Paiva, 2009).

When interviewees were asked about the need for greater dissemination of information regarding the adequate management of waste produced by equine farming, 86 respondents expressed the need for more information. They mentioned that crucial information about the proper management of these wastes does not reach equine farmers, resulting in little guidance. Producers often do not know how to properly manage this waste, which leads them to find their solutions for storage, use, and disposal.

Some interviewees also noted that, in certain cases, producers know that they are dealing with waste inappropriately, but cultural issues in the state of Rio Grande do Sul and family traditions end up contributing to the continuation of incorrect methods. Furthermore, it was noted that entities such as municipal Environment Secretariats and unions do not provide adequate assistance in this matter, particularly concerning the proper treatment, reuse, and disposal of hazardous waste. Although the direct responsibility for the management of healthcare waste lies with the generating sites, there is the principle of shared responsibility, in which everyone involved is responsible for the appropriate management of waste (Corrêa & Xavier, 2013).

Two interviewees mentioned that they did not see the need for more information, as they were already carrying out management as far as possible. However, there has been criticism regarding the bureaucracy for managing the healthcare waste, which makes its proper management unfeasible. Due to the small production of disposable materials for this type of waste, it is not economically viable to hire a specialized collection service. Interestingly, no interviewee declared that they sought information out of self-interest on the subject.

When interviewees were questioned about the importance of implementing good management practices, the majority justified their significance primarily due to the risks of environmental contamination on the property resulting from improper disposal. However, most were unable to clearly specify or explain what these risks were. Furthermore, 'preservation of the environment' and 'control of the final destination of each waste' were mentioned as important reasons.

Two interviewees associated the inadequate management of healthcare waste with several problems, such as the risk of spreading diseases, the danger of injuries caused by cuts or punctures when dealing with this waste, both for the people who handle it and for the animals that handle it. may come into contact with sharp or piercing objects. They also highlighted environmental contamination, relating it to soil, surface and groundwater. One of these interviewees emphasized his dependence on the environment for agricultural production on his property, emphasizing the need to properly manage this waste. This demonstrates a higher level of knowledge and concern from this producer. This same interviewee discarded Healthcare Waste at a collection point.

There was one interviewee who did not relate healthcare waste to a potential risk of contamination, justifying that zoonoses in horses are rare. In this way, he associated the risks only with human beings and pathologies, discarding the potential for contamination of the environment by drug residues, for example

The majority of research participants did not perceive agricultural waste as a significant issue, viewing it merely as organic fertilizer, even without prior treatment. For them, waste such as manure, food scraps and bedding are easily deteriorated and suitable for fertilization, which does not constitute a risk to the environment. Despite this, some believed that these types of waste could cause some type of environmental impact, even though they did not exemplify them.

The incorrect use of waste, in addition to being able to cause contamination of surface or underground water sources, can also cause biological contamination of the environment if the waste is not adequately treated. One of the most serious negative impacts that can occur, considering the repeated applications of large quantities of animal waste in the same areas, is water pollution, caused by excess phosphorus retained in the soil. This excess is due to the inability of plants to absorb the applied amounts. The greater the amount of phosphorus accumulated in the soil, the greater the risk of losing this element through erosion and leaching (Seganfredo, 2001). Moreover, even with the treatment of waste of animal origin, when poorly managed, it does not eliminate the pathogenic microorganisms present in this waste, which when used in vegetables, which may be consumed raw, becomes a vehicle for transmitting diseases (Silva et al., 2017).

Only two interviewees mentioned the attraction of flies and foul odors caused by waste as negative environmental impacts resulting from inadequate storage or packaging. No interviewee reported knowing or being concerned about the potential for contamination of dead animals. One owner did not know how to answer why it was important to adopt the correct management of waste generated by confined equine farming.

In this research, the inadequate management of healthcare waste was associated with the lack or little knowledge of respondents on how to manage them correctly and their negative impacts on the environment. They were also associated with the absence or little support from institutions for waste management, bureaucratic and/or economic issues, which makes it impossible to hire collection services for this waste, cultural issues both in the state and family, and finally, the lack of concern of producers with the correct management of the waste produced, which partly corroborates with WHO (2018) and Hakim et al. (2012), although not specifically in the same equine farming sector. The authors associated management failures with a lack of concern, insufficient financial and human resources, inadequate training, low priority given to the issue, lack of waste management and disposal, in addition to many countries not having appropriate regulations. Harhay et al. (2009) attributed failures in waste management mainly to financial issues and who is responsible for this management in low and middle-income countries.

IV. Conclusion

In terms of distances from surface waters, most establishments demonstrated compliance with current legislation. However, when it comes to managing the waste produced, many of those interviewed showed limited knowledge on the subject, leading to the adoption of inadequate management practices.

The majority of establishments do not treat organic agricultural waste, although it was found to be used as fertilizer, which is a recommended practice, especially when treated properly. During the storage stage, over half of those interviewed stored waste in open areas, which increases the risk of attracting flies, emitting foul odors, and runoff into watercourses, potentially leading to contamination.

Inadequacies in the management of healthcare waste were also identified in most of the locations interviewed. Despite existing regulations, compliance remains an issue, particularly in confined equine farming. Although this sector generates a relatively small volume of healthcare waste compared to other types discussed here, economic constraints make it challenging to afford specialized collection services.

Regarding agricultural waste management, there are no specific regulations for equine farmers on packaging, treatment, use, and disposal, contributing to the lack of adoption of good environmental practices.

In conclusion, establishments with confined horses in the state of Rio Grande do Sul do not adequately manage the waste they produce. Adopting appropriate procedures for all types of waste discussed here is essential for fostering a more sustainable agricultural production system.

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