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Comprehensive Assessment of Animal Welfare Standards in Small Pig Farms of Assam

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ABSTRACT

Background: Assam's scenic landscapes and rich agricultural heritage are intertwined with traditional piggery practices, which hold cultural and economic significance, particularly among tribal communities. Questions about animal welfare standards within these traditional setups linger despite their communal ethos. Evaluating their impact is vital for sustainable farming, rural livelihoods, and ecological preservation.

Methods: The study designed and applied a rigorous methodology that assessed animal welfare standards in Assam's pig farming. It involved a two-part study design, which included selecting the relevant indicators for conducting the study and assessing small pig farms across the different agro-climatic zones of Assam. Data collection from small-pig farmers across Assam's zones using a 5-point Likert scale was followed by descriptive statistical analysis.

Result: Housing facilities in Assam's pig farms provide ample space, fostering positive social dynamics and natural behaviours. However, tethering remains a concern, limiting movement and behaviour expression. While pigs were not found to be overly thin or emaciated, feeding practices could be improved for optimal growth and ideal body score. Limited veterinary involvement poses challenges in managing health issues. Recommendations include avoiding tethering, optimising feed, enhancing collaboration with veterinarians, and ensuring comfortable quarantine areas to promote pig welfare and health.

Key words: Animal welfare, Small-scale piggery, Sustainability, Traditional livestock.

INTRODUCTION

The beautiful and green landscapes of Assam, characterised by its picturesque hills, lush valleys and ample water resources, epitomise the region's intrinsic natural beauty. In Assam, piggery holds significant importance among all livestock practices, particularly among the tribal population, serving as a cornerstone of their cultural and economic sustenance (Borah, 2018; Saikia *et al*., 2017; Tripathi and Balaraju, 2017). Today, Assam has emerged as India's top contributor to pig production, with over 2 million pigs (Department of Animal Husbandry and Dairying, 2019).

Piggery in Assam goes beyond mere economic function (Dutta, 2022). It represents a unique element of the region's cultural and socio-economic fabric. The age-old tradition of nurturing small pig herds with minimal intervention and traditional housing methods defines Assamese piggery uniquely (Goswami and Barua, 2024). Nevertheless, the predominance of these traditional practices raises pertinent queries regarding adherence to animal welfare standards. Given the limited resources allocated to this traditional approach, it becomes imperative to scrutinise its impact on the well-being of the pigs. Such scrutiny is crucial not only for the welfare of rural communities but also for preserving traditional livelihoods and safeguarding the state's diverse ecology.

MATERIALS AND METHODS

A robust methodology is essential for research, ensuring precise data collection, analysis and interpretation. By adhering to established methods, researchers minimise errors and biases, enhancing reliability and transparency (Patel and Patel, 2019). The research work was carried out from 2021-24 under Assam Don Bosco University.

Two-part study design

The research was divided into two distinct phases to ensure a thorough examination of animal welfare standards within the context of pig farming in Assam. In the initial phase, the focus was on identifying and validating indicators crucial for assessing adherence to standards of animal welfare. Subsequently, in the second phase, adherence to standards of animal welfare was rigorously assessed using the validated indicators.

Literature review and adoption of hierarchical model

The study adopted a weighted hierarchical model of the PCI (Principle-Criteria-Indicator) framework, which offers a structured framework for sustainability assessment

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(Lammerts Van Bueren and Blom, 1997; Van Calker *et al.,* 2005). It organises assessment into principles, criteria, and Indicators, allowing for a systematic evaluation of sustainability and animal welfare goals. A review of past literature identified subthemes, principles, criteria, and relevant indicators. The standards are laid down by the WQ® protocol for setting the principles and criteria are presented in Table 1 (Blokhuis, 2009; Oven *et al.*, 2021).

Indicator definition and normalization

Each indicator was precisely defined for consistent interpretation. They were then normalized on a 5-point Likert scale, ranging from 1 (least desirable) to 5 (most desirable), ensuring standardized assessment. A score of 3 represents the minimum acceptable level of animal welfare.

Study area delimitation

The study area was confined to the geographical region of Assam, which is known for its significant pig farming activity. Specifically, the research focused on four of Assam's six agroclimatic zones, collectively accounting for close to 95% of the state's pig population (Das *et al.,* 2018; Nath and Mandal, 2018). This targeted approach ensured relevance and specificity to the study context.

Population and sampling

Experts in piggery, sustainability, and Assam's socio-cultural landscape were carefully selected using the snowballing method to ensure a highly qualified panel. Small-pig farmers in Assam, operating family-focused farms near their households, were targeted for assessment. Stratification by agroclimatic zones ensured representation across different agricultural contexts, with 400 farms evenly sampled across each stratum to comprehensively assess adherence to animal welfare standards.

Validation of indicator relevance

To ensure the validity of the identified indicators, the research employed the Expertise Selection Criteria (ESC) method, which is based on the Sustainability Levels in Belgian Agricultural Systems (SAFE) framework (Sauvenier *et al.*, 2006). A panel of experts, carefully selected for their expertise in piggery and sustainability, participated in the validation process. Indicators scoring above three on the Expert Agreed Score (EAS) were deemed relevant and shortlisted for further analysis. Fleiss' kappa interrater reliability was calculated and found to be 0.832 reflecting a substantial level of agreement between the different expert. Subsequently the weight was assigned to each of the indicators using the Delphi method. For reliability and consistency of measurements or ratings made by different observers, the interclass correlation coefficient (ICC) was found to be 0.982 highlighting a high level of agreement among the experts.

Field-level data collection and analysis

Data collection utilized a meticulously designed and validated questionnaire to gather insights into small pig farming practices and animal welfare adherence in Assam. SPSS was employed for thorough analysis, primarily using descriptive analysis to examine data characteristics and patterns. A test-retest validation test ensured the reliability of findings, facilitating robust statistical analysis and valid conclusions on small pig farm environmental sustainability in Assam.

The following equation was used to calculate the sustainability index of each principle Pscore.

$$P_{score} = \sum_{i=1}^{p}\left[\sum_{i=1}^{c}\left\{\left(\frac{\sum_{i}^{n}=1}{n}\right)\times w_i\right\}\times w_c\right]$$

n = Number of respondents.
I = Relevant Indicators associated with the criteria.
i = Increment variable .
Wi = Weightage of the indicator in the criteria.
c = Number of indicators within a criteria.
Wc= Weightage of the criteria in the principle.
p = Number of criteria within a principle.
P score = Sustainability index of a particular principle.

Based on the scoring system ranging from 1 to 5, the categorisation is as follows:

- A score of 1 is considered the least desired animal welfare level.
- A score between 1.01 and 2.99 is considered inconducive to animal welfare.
- A score of 3 is considered as the minimum level of accept able standard of animal welfare.
- Between 3.01 and 4.99 is considered as conducive to animal welfare.
- A score of 5 is considered the most desired level of animal welfare.

RESULTS AND DISCUSSION

Data from the 400 farms spanning four distinct agro-climatic zones was systematically gathered through a combination of surveys and structured interviews. The data has been presented based on the four agroclimatic zones North Brahmaputra Plains (NBP), Upper Brahmaputra Valley

Table 1: Principles and criteria.

Principle	Criteria
Good feeding	Absence of prolonged hunger
	Absence of prolonged thirst
Good housing	Comfort around resting.
	Thermal comfort
	Ease of movement
Good health	Absence of injuries
	Absence of disease
	Absence of pain induced by man agement procedures
Appropriate behaviour	Expression of social behaviours
	Expression of other behaviours
	Good human-animal relationship
	Positive emotional state

Adapted from WQ® protocol (Blokhuis, 2009).

(UBV), Lower Brahmaputra Valley (LBV), Hill Zone (HZ) and as a consolidated form across all the agroclimatic zones. Additional segmentation has been based on the type of rearing cycle adopted by the farmers and whether they are breeder (B), fatteners (F), or adopting both breeding and fattening closed cycle (C) rearing practice.

Good feeding

Fig 1 indicated that although prolonged hunger did not appear to fall below the minimum acceptable level, none of the zones or types of farms showed an aggregate index level categorised as conducive to animal welfare. During the field study, body score indexes ranged from a minimum of 3.14 to 3.53, indicating a need for collective improvement efforts. Farmers should include a balanced diet in pig feed rations to achieve ideal weight gain, which is essential for both animal welfare and economic gains.

The observation of prolonged thirst across various types of farms with Pscore ranging from 2.68 to 3.23 underscores the critical need for consistent access to clean water for pigs in small pig farms of Assam. While trough-based drinkers were a common observation during the survey, their intermittent refilling during feeding times may not suffice to meet the animals' hydration needs adequately. Breeding farms, with their higher water requirements, seem to be particularly affected with an overall Pscore of 2.95 which falls below the minimum acceptable level.

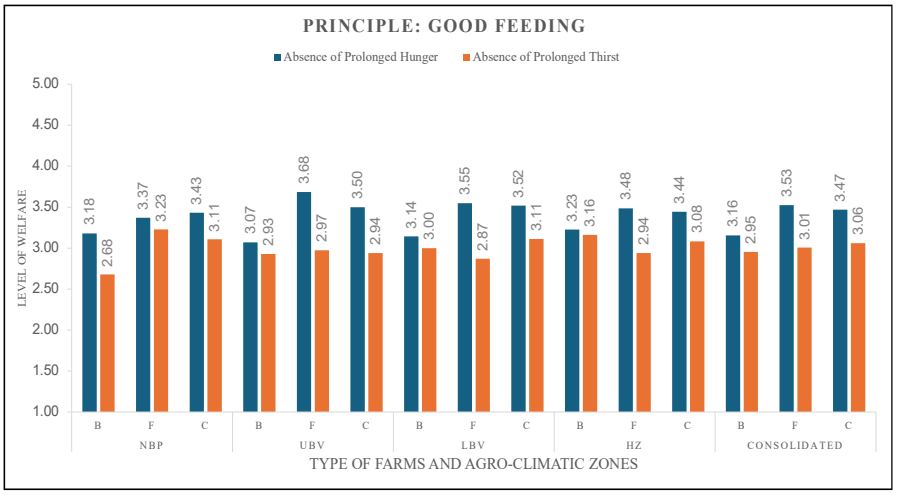

Fig 1: Welfare assessment on the principle of good feeding.

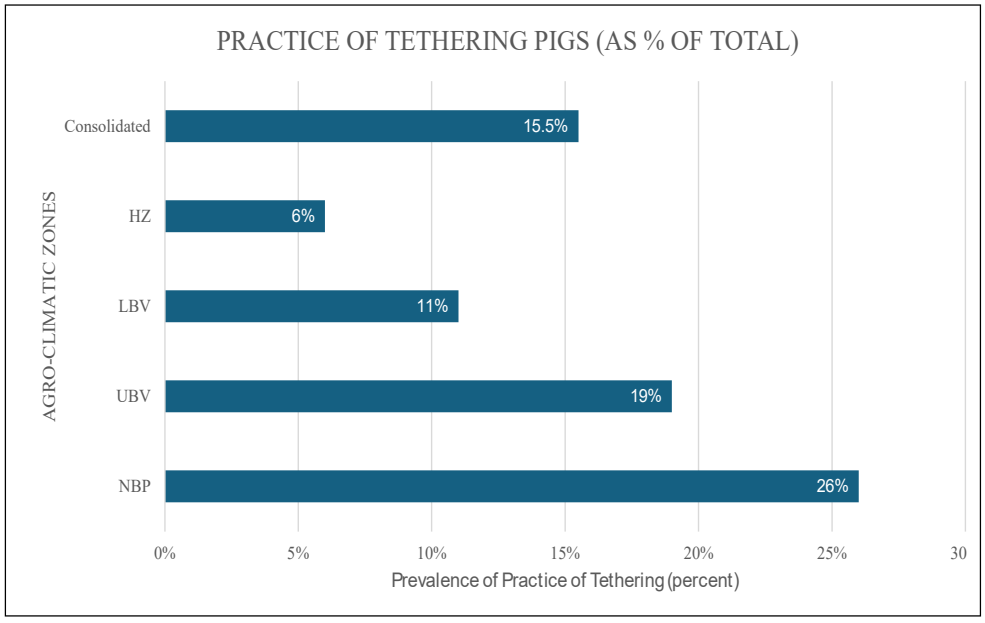

Fig 2: Prevalence of practice of tethering.

Good housing

It can be observed in Fig 2 that 15.5% of the surveyed farms followed the practice of tethering pigs to trees, poles, or pegs. The practice was more prevalent in the North Brahmaputra Plain zone (NBP) and Upper Brahmaputra Valley (UBV), with 26% and 19% of the farms practising tethering. The practice was least prevalent in the Hill Zone (HZ), with only 6% of the farms being seen to tether their pigs.

Observations as per Fig 3 revealed that animals in small pig farms in Assam were provided ample resting space and freedom of movement, aligning with the principles of good housing, the results of which can be referred in Fig 3 above. The consolidated score for farms across all agroclimatic zones revealed that ease of movement was provided to pigs across all types of farms and zones, with the minimum aggregate score recorded at 4.05, which is conducive towards animal welfare. Additionally, measures were taken to shield pigs from extreme temperatures to a large extent, ensuring their comfort and well-being, as evidenced by scores ranging from 4.41 to 4.57 and tending towards the most desired level of animal welfare.

Good health

It can be noted from Fig 4 that the standard practice for caring for injured or diseased animals involved separation, evident from a score above 3. However, this separation was often achieved through tethering and remedies were predominantly limited to home remedies or over-the-counter medicines.

It was also observed that none of the small pig farms in Assam utilised gestation crates or confined farrowing cages. However, there is a pressing need for these farms to enhance their housing standards for pregnant sows, as well as sows during farrowing and piglet weaning. Such improvements should focus on group housing methods that prioritise the provision of essential care, including adequate



Fig 3: Welfare assessment on the principle of good feeding.

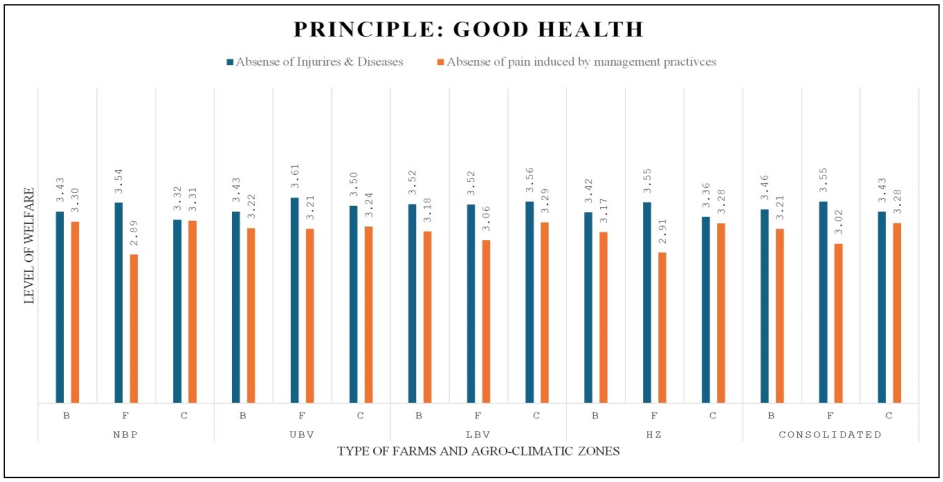

Fig 4: Welfare assessment on the principle of good health.

feed, water and measures to prevent piglet trampling. Additionally, it was noted that many farms did not seek professional veterinary assistance during procedures such as castration or minor surgeries.

Appropriate behaviour

A significant concern identified during the study (Fig 5) was the practice of group housing, where pigs of varying weights and ages were housed together and fed from the same trough, severely impacting the dynamics of social behaviour across various types of farms across geographies. This setup often led to conflicts during feeding times, affecting social dynamics among the pigs. Observations revealed instances of aggression, competition, and unequal access to food, which could impact the overall welfare of the animals and create stressful environments. Tethering was observed as another issue, where pigs were restricted in movement and unable to exhibit exploratory or social behaviours. This constraint not only limited their physical activity but also hindered their ability to engage in natural behaviours, potentially leading to boredom and frustration. These two phenomena were more evident in fattener farms in Upper Brahmaputra Valley, with a score of 2.21 and in North Brahmaputra Plains, with a score of 2.57 as depicted in Fig 5 above. The breeding farms in North Brahmaputra Plains, too, saw an unacceptable level of 2.89 in the same parameter.

Overall, animals, particularly in breeding and closed-cycle farming setups, were observed to engage in their natural behaviours, such as rooting, exploring and socializing, with scores of 4 and 3.79. However, the score for fattening animals, while still conducive to animal welfare at 3.29, was comparatively lower due to the restricted opportunities for social interaction noted in these farms.

Regarding the human-animal relationship, no significant concerns were identified during the study. Pigs, in general, appeared to be well accustomed to the presence of humans.

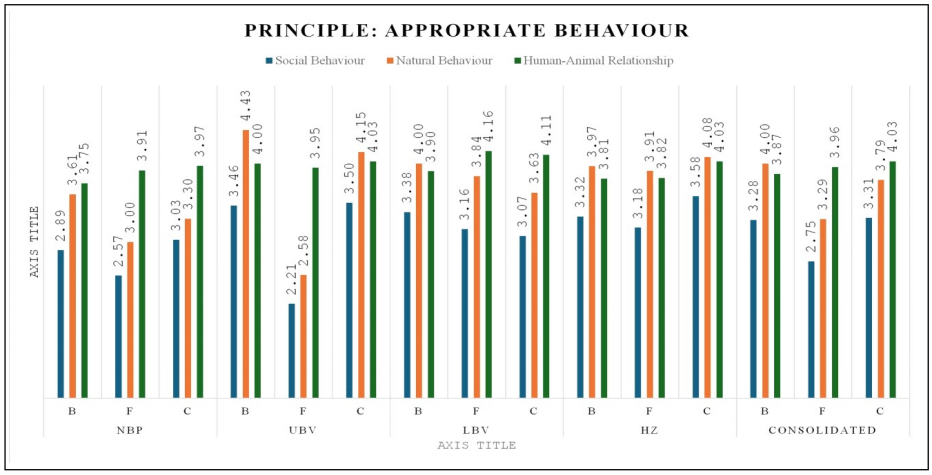

Fig 5: Welfare assessment on the principle of good health.

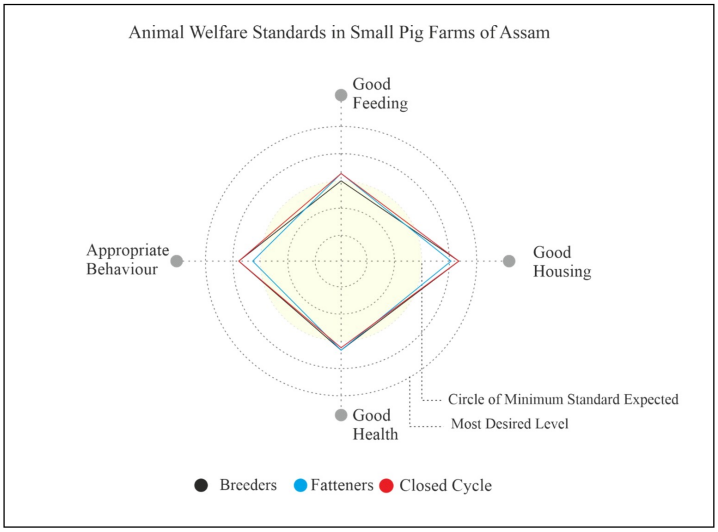

Fig 6: Radar graph of the principles of animal welfare.

Table 2: Consolidated scores of principles of animal welfare.

Principle	Consolidated scores		
	B	F	C
Good feeding	3.05	3.27	3.26
Good housing	4.37	4.03	4.32
Good health	3.33	3.29	3.35
Appropriate behaviour	3.75	3.40	3.78

This positive relationship suggests that the pigs were comfortable and familiar with human interaction, which is beneficial for handling management and overall welfare.

The four dimensions of animal welfare

In Assam, a notable uniformity is observed across various types of farms. However, the predominant focus revolves around ensuring optimal feed quality and maintaining robust pig health where scores were observed to be close to the level of minimum acceptable level of animal welfare as is evident from Fig 6 and Table 2.

During the study, it was observed that housing facilities across the range of farms exhibited a commendable provision of adequate open space and covered areas, fostering a conducive environment that positively impacted pigs' social dynamics and natural behaviours. This observation was pivotal as it highlighted the importance of ensuring pigs had sufficient space to engage in their innate behaviours, facilitating socialization and exploration, thereby contributing to their overall well-being. However, despite these positive aspects, the practice of tethering emerged as a significant concern, with notable implications for pig comfort and behaviour. The constraints imposed by tethering not only restricted the physical movement of pigs but also inhibited their ability to express natural behaviours freely.

Moreover, while pigs in Assam did not exhibit signs of malnourishment, the feeding practices across small pig farms often seemed to fall short of providing an ideal growth-supportive diet. This observation underscored the importance of optimizing feed composition to ensure pigs received adequate and balanced nutrition for optimal growth and health.

The study highlighted a crucial gap in veterinary input within small pig farms, particularly concerning managing diseased and injured animals. The limited involvement of veterinarians posed challenges in effectively addressing health issues and implementing appropriate treatment protocols.

CONCLUSION

In conclusion, while standards of animal welfare in Assam appear to meet the minimum level in most criteria, significant interventions are needed to ensure that the ideal level of welfare is achieved. This may involve addressing concerns such as housing conditions, feeding practices and veterinary care to enhance the overall well-being of pigs in the region. A few recommendations have been formulated to address these concerns comprehensively.

Firstly, avoiding tethering practices can significantly improve animal welfare in small pig farms of Assam, as it will help provide pigs with access to free and open spaces that allow for socialisation and the expression of natural behaviours. Additionally, in group housing, careful attention should be paid to ensure equitable access to feed and water for pigs of varying sizes and ages, ideally housing animals of similar age and weight together to minimise competition and stress.

Moreover, there is a pressing need to enhance collaboration with veterinarians, particularly in matters related to castration, surgeries and managing health issues. It is also imperative to ensure that quarantine areas are comfortable and conducive to the well-being of pigs, with the avoidance of tethering practices that may exacerbate stress and discomfort.

Conflict of interest

All authors declare that they have no conflicts of interest.

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