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Adoption of Equine Management Practices, Constraints, and Welfare Implications among Horse Owners in South Gujarat, India

D.C.Moliya

drmoliya@kamdhenuuni.edu.in

kamdhenu University, Gujarat,India https://orcid.org/0009-0000-5322-724X

Research Article

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Abstract

The present study was conducted to assess the adoption of equine management practices, evaluate welfare implications, and identify major constraints faced by horse owners in South Gujarat, India. A total of 150 horse owners were selected through simple random sampling, and data were collected using a pre-tested structured interview schedule covering housing, feeding, breeding, foaling, healthcare, and behavioural management practices. The findings revealed that most respondents exhibited a moderate level of adoption of recommended equine management practices. Higher adoption was observed in hygiene maintenance (80.00%) and individual feeding systems (64.67%), whereas deficiencies were recorded in balanced nutrition, hoof care, ventilation, reproductive management, and preventive healthcare practices. Restricted movement and inadequate housing conditions were associated with behavioural abnormalities and compromised welfare. Indigenous horses were predominantly preferred due to adaptability and lower maintenance costs, while Kathiawadi and Marwari breeds were maintained for cultural significance. Major constraints identified were lack of technical knowledge, high feed and veterinary costs, shortage of skilled farriers, and limited extension support. The study highlights the need for strengthened extension services, veterinary infrastructure, and welfare-oriented scientific management practices to improve sustainable equine welfare in South Gujarat.

Introduction

Horses (*Equus ferus caballus*) have historically played a vital role in human civilization, contributing to transportation, agriculture, warfare, and socio-cultural traditions. In contemporary contexts, their roles have shifted toward recreation, sports, ceremonial functions, and livelihood support in rural economies (Fraser, 1992; McGreevy, 2004). In India, particularly in regions such as South Gujarat, horses continue to be integral to traditional events, tourism activities, and smallholder income systems. Despite their importance, equine management practices in many parts of the country remain largely traditional and are often not fully aligned with scientific recommendations (Singh et al., 2012; Pal et al., 2017).

Proper equine management, encompassing housing, feeding, breeding, healthcare, and training, is essential for maintaining health, productivity, and welfare. Scientific management practices such as balanced nutrition, appropriate stable design with adequate ventilation, regular hoof care, and preventive veterinary care significantly influence equine performance and longevity (McGreevy, 2004; Waran, 2007). However, the adoption of such practices is often influenced by socio-economic conditions, access to veterinary services, and the awareness level of horse owners (Upadhyay et al., 2014; Meena et al., 2019).

Animal welfare has emerged as a critical component of modern livestock management, with increasing emphasis on both the physical and psychological well-being of animals. In horses, welfare is closely associated with management conditions such as housing systems, feeding regimes, social interaction, and human handling practices (Cooper and Mason, 1998; Nicol, 1999; Lesimple, 2020). Poor management practices, particularly social isolation, inadequate nutrition, limited exercise, and improper housing, have been linked to the development of stereotypic behaviours such as crib-biting, weaving, and

stall-walking, which are clear indicators of compromised welfare (McBride and Hemmings, 2004; Søndergaard and Ladewig, 2004).

The human–horse relationship also plays a significant role in shaping equine behaviour and welfare outcomes. Positive handling and systematic training practices reduce stress and improve performance, whereas inconsistent or harsh handling may lead to fear responses, aggression, and behavioural abnormalities (Hausberger et al., 2008; Murphy and Arkins, 2007). Horses are highly sensitive to human cues and environmental stimuli; therefore, proper training, habituation, and socialization are essential components of effective management systems (Visser et al., 2008; Merkies and Franzin, 2021).

In developing regions, including India, several constraints hinder the adoption of improved equine management practices. These include limited access to veterinary infrastructure, shortage of skilled farriers, high cost of feed and healthcare services, and inadequate extension support (Kumar et al., 2015; Yadav et al., 2020). Additionally, low awareness and limited technical knowledge among horse owners contribute to suboptimal management practices, thereby adversely affecting both productivity and welfare outcomes (Meena et al., 2019). Addressing these constraints is essential for improving the sustainability and efficiency of equine production systems.

Although considerable research has been conducted on equine behaviour and welfare in developed countries, region-specific studies in India—particularly in South Gujarat—remain limited. The unique socio-economic, cultural, and management context of this region necessitates a localized assessment of equine management practices and associated constraints. Understanding the current status of equine management and its implications for animal welfare is crucial for designing effective extension strategies and targeted interventions.

Therefore, the present study was undertaken to evaluate the adoption of equine management practices, assess their welfare implications, and identify the major constraints faced by horse owners in South Gujarat, India. The findings are expected to contribute to evidence-based policy formulation and the development of sustainable strategies for improving equine welfare and management practices in the region.

Materials and Methods

Geography and Climate of the Study Area

The present study was conducted in the coastal and southern region of Gujarat, India. The study area included seven districts, namely Surat, Navsari, Valsad, Dang, Tapi, Bharuch, and Narmada, which lie predominantly south of the Narmada River.

The region falls under a sub-tropical climatic zone with a sub-humid to humid climate, particularly influenced by coastal proximity and varied topography. The area experiences moderate climatic variations, with relatively milder conditions in coastal and hilly regions, while inland areas experience

higher temperatures. The average winter daytime temperature is around 25°C, with nighttime temperatures dropping to approximately 12°C under generally clear and sunny conditions. During summer, daytime temperatures may rise up to 40°C, while nighttime temperatures remain around 30°C (COI, 2019).

The climatic conditions, combined with moderate to high humidity, support diverse livestock and equine activities, particularly those associated with rural livelihoods, ceremonial functions, tourism, and transport purposes.

Sampling Procedure

A simple random sampling technique was employed for the selection of horse owners from each selected district. Based on the equine population data obtained from the 20th Livestock Census, approximately 5–10% of horse owners were considered for inclusion in the study to ensure adequate representation.

A total sample size of 150 horse owners was finalized for the present investigation, ensuring balanced coverage across all selected districts.

Selection of Districts

The study was conducted in seven districts of South Gujarat. The selection was based on the presence and distribution of horse populations as reported in the 20th Livestock Census. District-wise horse population data were used to identify equine-dense regions for inclusion in the study.

Selection of Respondents

A total of 150 horse owners were selected using proportionate random sampling based on the horse population in each district. Care was taken to ensure uniform distribution of respondents across all selected districts.

The sampling design also accounted for variation in:

- horse breeds (indigenous and recognized breeds such as Kathiawadi and Marwari),
- management systems, and
- usage patterns (transport, ceremonial, agricultural, and recreational purposes),

to obtain a representative dataset for assessing adoption of management practices, welfare implications, and constraints.

Data Collection

Primary data were collected through personal interviews using a pre-tested structured interview schedule. The questionnaire was designed to capture information on:

- Socio-economic characteristics (age, education, housing status, landholding, occupation)
- Equine management practices (feeding, housing, breeding, healthcare, shoeing, vaccination, and deworming)
- Horse-related parameters (breed, age, sex, body condition score, and purpose of rearing)
- Welfare-related aspects (behavioural conditions, housing environment, and management stress indicators)
- Constraints faced by horse owners in management and healthcare

The interview schedule was validated through a pilot survey conducted on a small group of respondents prior to final data collection.

Variables and Measurement

- Housing status was categorized as own house, own farm house, rented individual house, and rented farm house.
- Landholding was classified into landless, 1–5 bigha, 5–10 bigha, and > 10 bigha categories.
- Body Condition Score (BCS) of horses was assessed visually using a standard scoring system ranging from poor to very good condition.
- Adoption of management practices was measured based on compliance with recommended practices in feeding, housing, breeding, healthcare (vaccination and deworming), hoof care, and exercise management.
- Welfare implications were assessed indirectly through management conditions, housing quality, and behavioural indicators reported by owners.

Statistical Analysis

The collected data were coded, tabulated, and analyzed using appropriate statistical methods. Descriptive statistics such as frequency and percentage were used to summarize the data.

The Chi-square (χ^2) test was applied to determine the association between categorical variables and to assess differences among groups. The level of significance was tested at $p < 0.05$ and $p < 0.01$.

Results and Discussion

The study indicates moderate to high adoption of equine management practices in South Gujarat. Feeding, watering, and neonatal care practices were relatively well adopted, while grazing, fodder

processing, and balanced nutrition require improvement. Constraints such as cost, lack of technical knowledge, and limited extension support influence adoption patterns. Similar findings have been reported by Boradiya et al. (2019), Patel et al. (2020), and Singh (2022). Welfare implications are directly linked to housing, feeding, and healthcare systems (Lesimple, 2020; McGreevy & McLean, 2010).

Table 1
Adoption of Equine Feeding and Management Practices (n = 150)

Management practice	Category	Frequency	Percentage	χ^2 value	df	p-value
Feeding system	Stall feeding	80	53.33	28.76	2	< 0.001
	Pasture grazing	23	15.33			
	Stall + grazing	47	31.34			
Feeding type	Mixed feed	79	52.67	41.41	3	< 0.001
	Green fodder	21	14.00			
	Dry fodder	23	15.33			
	Grains & concentrates	27	18.00			
Feeding source	Homemade	80	53.33	22.36	2	< 0.001
	Commercial	39	26.00			
	Mixed	31	20.67			
Feeding practice	Individual feeding	97	64.67	67.08	2	< 0.001
	Group feeding	22	14.67			
	Both	31	20.66			
Concentrate frequency	Once/day	36	24.00	8.11	3	< 0.05
	Twice/day	41	27.33			
	Three times/day	49	32.67			
	Ad libitum	24	16.00			
Watering system	Once/day	23	15.33	92.08	3	< 0.001
	Twice/day	14	9.33			
	Three times/day	17	11.33			
	Ad libitum	96	64.00			
Vitamin supplementation	Yes	97	64.67	12.91	1	< 0.001
	No	53	35.33			
Mineral mixture	Yes	103	68.67	20.91	1	< 0.001
	No	47	31.33			
Salt feeding	Yes	91	60.67	6.83	1	< 0.01

Management practice	Category	Frequency	Percentage	χ^2 value	df	p-value
	No	59	39.33			
Grazing practice	No grazing	103	64.00	92.08	3	< 0.001
	1–3 hrs	23	15.33			
	3–6 hrs	14	9.33			
	6–9 hrs	17	11.33			
Pregnancy feeding	Yes	127	84.67	72.11	1	< 0.001
	No	23	15.33			
Post-foaling feeding	Yes	111	74.00	33.12	1	< 0.001
	No	39	26.00			
Colostrum feeding	Yes	135	90.00	96.00	1	< 0.001
	No	15	10.00			
Quantity of Feed	Dry fodder (up to 5 kg/day)	39	26.00	22.11	3	< 0.001
	Green fodder (up to 10 kg/day)	35	23.33			
	Concentrate (up to 7 kg/day)	59	39.33			
	Others	17	11.34			
Grazing Duration	1–3 hrs.	23	15.33	92.08	3	0.00
	3–6 hrs.	14	9.33			
	.6–9 hrs.	17	11.33			
	.No grazing.	103	64.00			
Chopping of Fodder	Always	80	53.33	28.76	2	0.00
	Sometimes	23	15.33			
	Never	47	31.34			
Knowledge of Gram Feeding	Yes	117	78.00	47.04	1	0.00
	No	33	22.00			
Feeding Schedule	One time/day	27	18.00	8.54	3	0.05
	Two time/day	48	32.00			

Management practice	Category	Frequency	Percentage	χ^2 value	df	p-value
	Three time/day	49	32.67			
	Adlib	26	17.33			
Quantity of colostrum offered first time	Not Adopt	23	15.33	92.08	3	0.00
	Faulty Adopt	14	9.33			
	Partially Adopt	17	11.33			
	.Right Adopt	96	64.00			
Frequency of colostrum fed to foal	Adlib	23	15.33	96.24	3	0.00
	Quarterly	14	9.33			
	10% of Body weight (Kg).	98	65.34			
	None	15	10.00			

Feeding of Horses

The data presented in Table 1. revealed that a majority of respondents of 64.67% (97/150) practiced individual feeding, followed by both individual and group feeding in 20.66% (31/150), while 14.67% (22/150) followed group feeding alone. Individual feeding allows precise control over intake, better health monitoring, and prevention of feed competition, which may explain its higher adoption. Similar findings were reported by Boradiya et al. (2019) and Singh (2022), who observed predominance of individual feeding in equine systems. The Chi-square test showed a highly significant difference ($\chi^2 = 67.08$, $p < 0.001$).

Source of Feed

More than half of the respondents 53.33% (80/150) used homemade feed, followed by commercial feed of 26.00% (39/150) and mixed feed by 20.67%. (31/150) Preference for homemade feed reflects cost-effectiveness and traditional practices, though it may lead to nutritional imbalance if not properly formulated. Similar trends were reported by Patel et al. (2020). The difference was highly significant ($\chi^2 = 22.36$, $p < 0.001$).

Type of Feed Offered

Mixed feeding (green fodder, dry fodder, and concentrates) was practiced by 52.67% (79/150) of respondents, followed by concentrates 18.00%(27/150), dry fodder 15.33% (23/150), and green fodder 14.00% (21/150). Mixed feeding ensures balanced nutrition and better performance. Comparable findings were reported by Boradiya et al. (2019). The variation was highly significant ($\chi^2 = 41.41$, $p < 0.001$).

Quantity of Feed

Concentrates up to 7 kg/day were provided by 39.33% (59/150) of respondents, followed by dry fodder 26.00% (39/150) and green fodder of 23.33% (35/150) Only 11.34% (17/150) followed irregular feeding. This reflects increasing awareness of energy requirements in working horses. Similar observations were reported by Singh (2022). The difference was highly significant ($\chi^2 = 22.11$, $p < 0.001$).

Frequency of Feeding Concentrates.

Feeding three times daily 32.67% (49/150) and twice daily 27.33% (41/150) were most common, followed by once daily 24.00% (36/150) and ad libitum feeding 16.00% (24/150). Frequent feeding supports digestive health and reduces metabolic disorders (NRC, 2007). The variation was significant ($\chi^2 = 8.11$, $p < 0.05$).

Feeding Schedule

Three-times feeding 32.67% (49/150) and twice daily feeding 32.00% (48/150) were predominant, while ad libitum feeding was practiced by 17.33% (26/150) Structured feeding schedules reflect improved awareness of equine digestive physiology (McGreevy & McLean, 2010). The difference was significant ($\chi^2 = 8.54$, $p < 0.05$).

Feeding Systems

Complete stall feeding was practiced by 53.33% (80/150) of respondents, followed by stall + grazing 31.34% (47/150) and grazing alone 15.33%(23/150). Stall feeding predominates due to land constraints and management convenience. Similar trends were reported by NRC (2007). The difference was highly significant ($\chi^2 = 28.76$, $p < 0.001$).

Knowledge of Gram Feeding

A majority of respondents 78.00% (117/150) were aware of gram feeding requirements, indicating traditional knowledge-based feeding practices. The difference was highly significant ($\chi^2 = 47.04$, $p < 0.001$).

Grazing Duration

Most respondents 64.00% (103/150) did not allow grazing, while only 36.00% (47/150) permitted limited grazing. This reflects dominance of stall-feeding systems. Similar findings were reported by Patel et al. (2020). The difference was highly significant ($\chi^2 = 92.08$, $p < 0.001$).

Chopping of Fodder

Always chopping fodder was practiced by 53.33% (80/150) while 31.34% (47/150) never chopped fodder. This indicates partial adoption of scientific feeding practices. NRC (2007) recommends chopped fodder for better digestibility. The difference was highly significant ($\chi^2 = 28.76$, $p < 0.001$).

Feeding During Pregnancy and Foaling

Special feeding during pregnancy 84.67% (127/150) and after foaling 74.00% (11/150) was widely practiced, reflecting good awareness of reproductive nutritional requirements. Similar findings were reported by NRC (2007) and Singh (2022). Both practices showed highly significant differences ($p < 0.001$).

Mineral, Vitamin and Salt Supplementation

Vitamin supplementation 64.67% (97/150), mineral mixture uses 68.67% (103/150), and salt feeding 60.67% (91/150) indicate moderate adoption of micronutrient management. These supplements are essential for immunity, reproduction, and performance (Geor et al., 2013; NRC, 2007). All practices showed significant variation ($p < 0.01$ to $p < 0.001$).

Watering Practices

Ad libitum watering 64.00% (96/150) was most common, indicating good awareness of physiological water requirements. NRC (2007) recommends free access to clean water. The variation was highly significant ($\chi^2 = 92.08$, $p < 0.001$).

Colostrum Feeding Practices

A high proportion of respondents ensured colostrum feeding 90.00% (135/150), correct quantity 64.00% (96/150), and recommended frequency 65.34% (98/150). This reflects strong awareness of neonatal survival practices. Colostrum intake is essential for passive immunity in foals (McCue, 2014; NRC, 2007). All associations were highly significant ($p < 0.001$).

OVERALL INTERPRETATION

The study indicates moderate to high adoption of equine management practices in South Gujarat. Feeding, watering, and neonatal care practices were relatively well adopted, while grazing, fodder processing, and balanced nutrition require improvement. Constraints such as cost, lack of technical knowledge, and limited extension support influence adoption patterns. Similar findings have been reported by Boradiya et al. (2019), Patel et al. (2020), and Singh (2022). Welfare implications are directly linked to housing, feeding, and healthcare systems (Lesimple, 2020; McGreevy & McLean, 2010).

Equine Owners and Their Welfare Implications

The findings demonstrate that knowledge level, training exposure, institutional participation, and information access significantly influence equine welfare practices. The results highlight the need for targeted extension interventions, capacity-building programmers, and improved access to veterinary and educational services to enhance equine welfare in the study area.

Table 2
Summary of Knowledge, Training, and Welfare-Related Characteristics (n = 150)

Parameter	Category	Frequency	Percentage	χ^2 value	p-value
Knowledge level	Very low	10	6.67	50.80	< 0.001
	Low	15	10.00		
	Medium	57	38.00		
	High	44	29.33		
	Very high	24	16.00		
Training attended	Yes	90	60.00	6.00	< 0.05
	No	60	40.00		
Grooming knowledge	Yes	119	79.33	51.63	< 0.001
	No	31	20.67		
Club registration	Yes	90	60.00	6.00	< 0.05
	No	60	40.00		
Mass media exposure	Yes	112	74.67	36.51	< 0.001
	No	38	25.33		< 0.001
Zoonotic awareness	Yes	131	87.33	82.08	
	No	19	12.67		
Social Participation	Panchayat	65	43.33	35.93	< 0.001
	Co-operative	15	10.00		
	Youth club	29	19.33		
	Association	41	27.33		

The distribution of equine owners according to their knowledge of scientific horse rearing practices indicated that the largest proportion of respondents possessed a medium level of knowledge 38.00% (57/150), followed by high 29.33% (44/150) and very high 16.00% (24/150) categories, whereas comparatively fewer respondents were classified under low 10.00% (15/150) and very low 6.67% (10/150) levels. The chi-square analysis revealed a highly significant difference ($\chi^2 = 50.80$, df = 4, $p < 0.001$), indicating substantial heterogeneity in knowledge levels among respondents. (Table 2.). This variability suggests uneven access to scientific information and extension services. The findings are consistent with the Diffusion of Innovations theory (Rogers, 2003), which identifies knowledge as a fundamental prerequisite for the adoption of improved practices. Similar conclusions have been drawn

by FAO (2011) and OIE (2019), emphasizing that enhanced knowledge and capacity building are critical determinants of improved equine welfare outcomes.

With regard to training exposure, 60.00% (90/150) of respondents reported having attended workshops or training programmers on horse behaviour, while 40.00% (60/150) lacked such exposure. The association was statistically significant ($\chi^2 = 6.00$, df = 1, $p < 0.05$), underscoring the role of formal training in shaping management practices. Training enhances understanding of equine behaviour, learning theory, and humane handling techniques, thereby reducing the likelihood of stress-induced behavioural problems. These findings are in agreement with McGreevy and McLean (2010) and Hockenhull and Creighton (2013), who reported that trained handlers are more likely to adopt evidence-based and welfare-oriented practices. Furthermore, FAO (2011) and OIE (2019) highlighted structured training as a key strategy for improving animal welfare standards.

A substantial majority of respondents 79.33% (119?150) demonstrated knowledge of grooming practices, with a highly significant difference ($\chi^2 = 51.63$, df = 1, $p < 0.001$). (Table 2.). Grooming is a fundamental aspect of equine management, contributing to hygiene, parasite control, improved circulation, and early detection of injuries or diseases. The high level of awareness observed may reflect the routine nature and visible benefits of grooming. These findings corroborate McGreevy (2012), who emphasized that regular grooming strengthens the human–horse relationship and reduces behavioural stress, while FAO (2011) and OIE (2019) identified grooming as a basic requirement for maintaining equine welfare.

Institutional linkage, as reflected by club registration of horses 60.00% (90/150), was also found to be significantly associated ($\chi^2 = 6.00$, df = 1, $p < 0.05$). Membership in equine organizations facilitates access to breeding services, veterinary care, and exposure to improved management practices. This supports earlier reports by Kumar et al. (2014) and Pritchard et al. (2005), who highlighted that institutional participation enhances the adoption of scientific and welfare-oriented practices through improved information exchange and peer learning.

Social participation patterns revealed that involvement was highest in Panchayats 43.33% (65/150), followed by associations 27.33% (41/150), indicating the importance of local institutional frameworks in knowledge dissemination. In addition, mass media exposure was reported by 74.67% (112/150) of respondents and showed a highly significant association ($\chi^2 = 36.51$, df = 1, $p < 0.001$). This finding underscores the effectiveness of media as a channel for disseminating scientific knowledge and promoting behavioural change. Similar observations have been reported in livestock extension studies, where media exposure significantly enhanced awareness and adoption of improved practices.

The study further revealed that a large majority of respondents 87.33% (131/150) were aware of zoonotic diseases, with a highly significant association ($\chi^2 = 82.08$, df = 1, $p < 0.001$). (Table 2.). This high level of awareness is encouraging, given the close human–animal interactions in equine enterprises. Knowledge of zoonotic risks is essential for adopting preventive measures such as sanitation, vaccination, and biosecurity practices. These findings are consistent with Pritchard et al. (2005), WHO

(2018), and OIE (2019), who emphasized that informed owners are more likely to implement effective health and hygiene practices, thereby safeguarding both animal and public health.

Overall, the results clearly demonstrate that knowledge level, training exposure, institutional participation, and access to information sources are key determinants of equine welfare practices. The observed associations highlight the need for targeted extension interventions, capacity-building programmers, and strengthened institutional support to bridge existing knowledge gaps and promote the adoption of scientifically sound and welfare-oriented equine management practices.

Table 3
Summary of constraints affecting equine management practices among horse owners in South Gujarat (n = 150)

Category	Major Constraints	Percentage (%)	χ^2 Value	df	P-value	Key Interpretation
Housing	High construction cost	71.33	19.44	1	< 0.001	Financial burden is the primary barrier to improved housing
	Lack of adequate space	28.67				Limited space affects welfare and management
Feeding	Lack of marketed feed supply	36.00	18.24	3	< 0.001	Market access and cost strongly influence feeding practices
	Costly feed ingredients	30.00				High feed prices limit balanced nutrition
	Lack of ration knowledge	20.00				Technical knowledge gap persists
	Fodder scarcity	14.00				Seasonal availability constraints
Breeding	Lack of superior pedigree animals	34.00	8.91	3	< 0.05	Genetic improvement constrained by availability
	High cost of quality breeds	26.00				Affordability limits adoption
	Difficulty in stallion access	21.33				Limited breeding infrastructure
	Lack of estrus detection knowledge	18.67				Knowledge gap in reproduction
Health Care	High veterinary cost	27.33	39.31	6	< 0.001	Economic and service constraints dominate
	Distant veterinary facilities	17.33				Accessibility issue
	Irregular veterinary visits	14.67				Weak extension services
	Vaccine unavailability	14.67				Preventive care limitation
	Lack of disease knowledge	14.67				Awareness gap
	Injuries due to vices	6.67				Behavioral management issue

Category	Major Constraints	Percentage (%)	χ^2 Value	df	P-value	Key Interpretation
	Lack of deworming	4.67				Minor but relevant constraint

The analysis of constraints associated with equine management in South Gujarat revealed that housing-related limitations were predominantly economic in nature. A significantly higher proportion of respondents reported high construction cost (71.33%) compared to lack of adequate space (28.67%) (Table 3.), with chi-square analysis indicating a highly significant difference ($\chi^2 = 19.44$, df = 1, $p < 0.001$). This finding suggests that financial constraints remain the primary barrier to adoption of improved housing practices. Similar observations have been reported by FAO (2011) and Pritchard et al. (2005), who emphasized that infrastructure cost directly affects stable quality and equine welfare, while inadequate space has been linked to behavioural and health disorders (McGreevy, 2012; Waran and Randle, 2017).

Feeding constraints were also found to be significantly varied ($\chi^2 = 18.24$, df = 3, $p < 0.001$), with lack of marketed feed supply (36.00%) and high cost of feed ingredients (30.00%) emerging as major issues, followed by lack of knowledge regarding balanced ration (20.00%) and fodder scarcity (14.00%) (Table 3.). These findings indicate that both economic and technical limitations influence feeding management. Previous studies by Ralston (1984) and Pagan (1998) similarly highlighted that feed cost and poor ration formulation knowledge restrict optimal nutritional practices, while FAO (2011) identified market access and fodder availability as key constraints in developing regions.

With respect to breeding, the major constraints included lack of superior pedigree animals (34.00%) and high cost of quality breeds (26.00%), along with difficulties in accessing suitable stallions and limited knowledge of estrus detection (Table 3). The chi-square analysis showed a statistically significant difference among these factors ($\chi^2 = 8.91$, df = 3, $p < 0.05$), indicating that both accessibility and affordability hinder genetic improvement. These results are in agreement with ICAR (2015) and FAO (2011), who reported limited availability of elite germplasm and inadequate breeding infrastructure in many equine production systems.

Health care constraints exhibited a highly significant variation ($\chi^2 = 39.31$, df = 6, $p < 0.001$), with high cost of veterinary medicines (27.33%) being the most prominent issue, followed by limited access to veterinary services, including distant facilities (17.33%), irregular veterinary visits, and untimely availability of vaccines (Table 3). Knowledge gaps regarding disease prevention and control were also evident. These findings corroborate earlier reports by Pritchard et al. (2005) and OIE (2019), which emphasized that cost and accessibility of veterinary services are critical determinants of equine health management. Furthermore, inadequate preventive care and limited awareness contribute to increased disease burden and welfare issues (McGreevy, 2012; Waran and Randle, 2017). Major constraints included lack of skilled farriers, high feed costs, and limited veterinary services, similar to findings by Singh (2022).

The shortage of skilled farriers is particularly critical, as improper hoof care can lead to lameness and reduced working efficiency. Similar constraints have been documented in rural equine production systems across India (Singh, 2022; Ravi & Kumar, 2023).

Overall, the results demonstrate that economic limitations, inadequate access to inputs and services, and knowledge gaps are the major constraints affecting the adoption of improved equine management practices in the study area.

Conclusion

The study concluded that horse owners in South Gujarat exhibited a moderate level of adoption of scientific equine management practices, with better adoption observed in hygiene maintenance and feeding management, while deficiencies persisted in balanced nutrition, hoof care, breeding, and preventive healthcare. Economic limitations, high feed and veterinary costs, shortage of skilled farriers, and inadequate technical knowledge were identified as the major constraints affecting adoption and equine welfare. The findings highlight the need for strengthened extension services, capacity-building programmers, improved veterinary infrastructure, and welfare-oriented management interventions to promote sustainable equine production and enhance horse welfare in the region.

Recommendations

Based on the findings of the study, the following recommendations are proposed to improve the socio-economic conditions and equine management practices among horse owners in South Gujarat:

1. **Strengthening Extension and Training Programs**
   Regular training and awareness programs should be organized to enhance farmers' knowledge on scientific housing, balanced feeding, breeding management, and disease prevention. Capacity-building initiatives can bridge existing technical knowledge gaps.
2. **Financial Support and Subsidy Schemes**
   Government and development agencies should provide subsidies or low-interest loans for construction of proper stables, purchase of quality feed, and veterinary care. Financial assistance will help reduce the burden of high input costs.
3. **Improvement in Feed and Fodder Availability**
   Establishment of local feed supply chains and promotion of fodder cultivation practices are necessary to ensure availability of quality feed at affordable prices. Training on ration balancing should also be emphasized.
4. **Development of Breeding Infrastructure**
   Access to superior pedigree animals and quality breeding services should be improved through establishment of breeding centers, stud farms, and artificial insemination facilities where feasible.
5. **Strengthening Veterinary Services**
   Veterinary infrastructure should be expanded, especially in rural areas, with regular visits by

veterinarians, timely availability of vaccines, and affordable treatment services. Mobile veterinary clinics can be an effective solution.

6. **Promotion of Welfare-Oriented Practices**
   Awareness regarding animal welfare, proper housing space, hygiene, and preventive health care should be promoted to reduce stress, injuries, and disease incidence in horses.
7. **Encouraging Cooperative and Community-Based Approaches**
   Formation of horse owner groups or cooperatives can facilitate collective access to inputs, veterinary services, and market opportunities, thereby improving overall efficiency.
8. **Policy Support and Research Focus**
   Policymakers should recognize the growing recreational and socio-cultural importance of horses and design region-specific policies. Further research should be encouraged to address emerging challenges in equine management.

Final Scientific Perspective

The study demonstrates that equine management practices in South Gujarat are strongly influenced by socio-economic conditions, technical knowledge, and accessibility to veterinary and extension services. Although horse owners exhibited moderate adoption of scientific management practices, significant gaps persist in feeding, healthcare, breeding, and welfare-oriented management. Economic constraints, inadequate infrastructure, shortage of skilled professionals, and limited awareness continue to hinder the adoption of improved practices and compromise equine welfare. Therefore, sustainable improvement in equine production systems requires integrated interventions focusing on scientific training, strengthened veterinary support, affordable input accessibility, and welfare-based management strategies to ensure enhanced productivity, health, and welfare of horses in the region.

Declarations

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Statement of animal rights

No approval from an institutional animal ethics committee was required for this study, as it was based on data collected from a consolidated database and did not involve any direct experimental procedures on animals. The study relied solely on observational and survey-based information obtained from horse owners, ensuring that no animals were subjected to handling, intervention, or treatment for research purposes.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study. The respondents

were informed about the purpose of the study, and their participation was voluntary.

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Conflict of Interest

The authors declare no conflict of interest.

Author contributions

D.C. Moliya: Conceptualization, data collection, data analysis, and manuscript writing.
Co-authors: Supervision, review, and editing of the manuscript.

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Figures

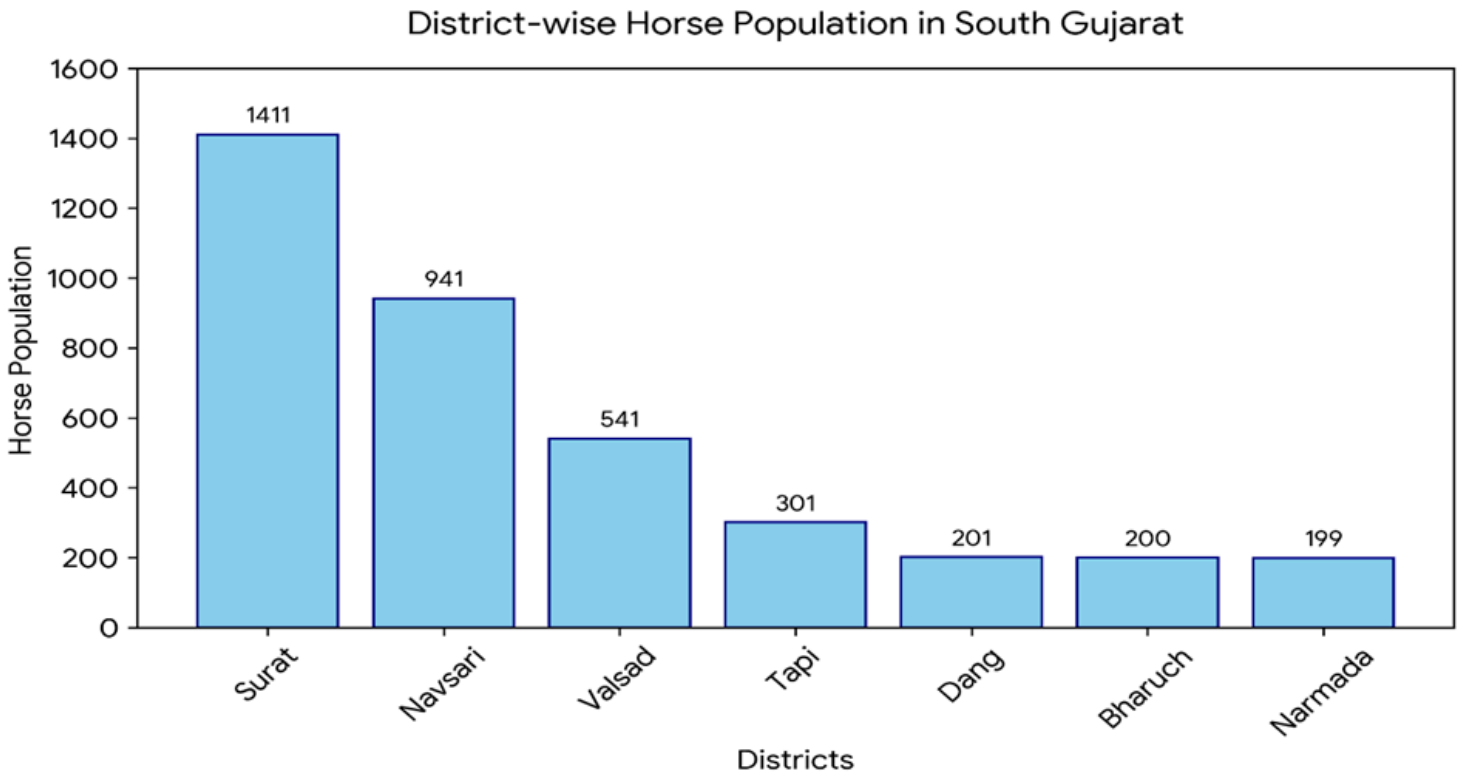


Figure 1

The district-wise horse population in South Gujarat, India.

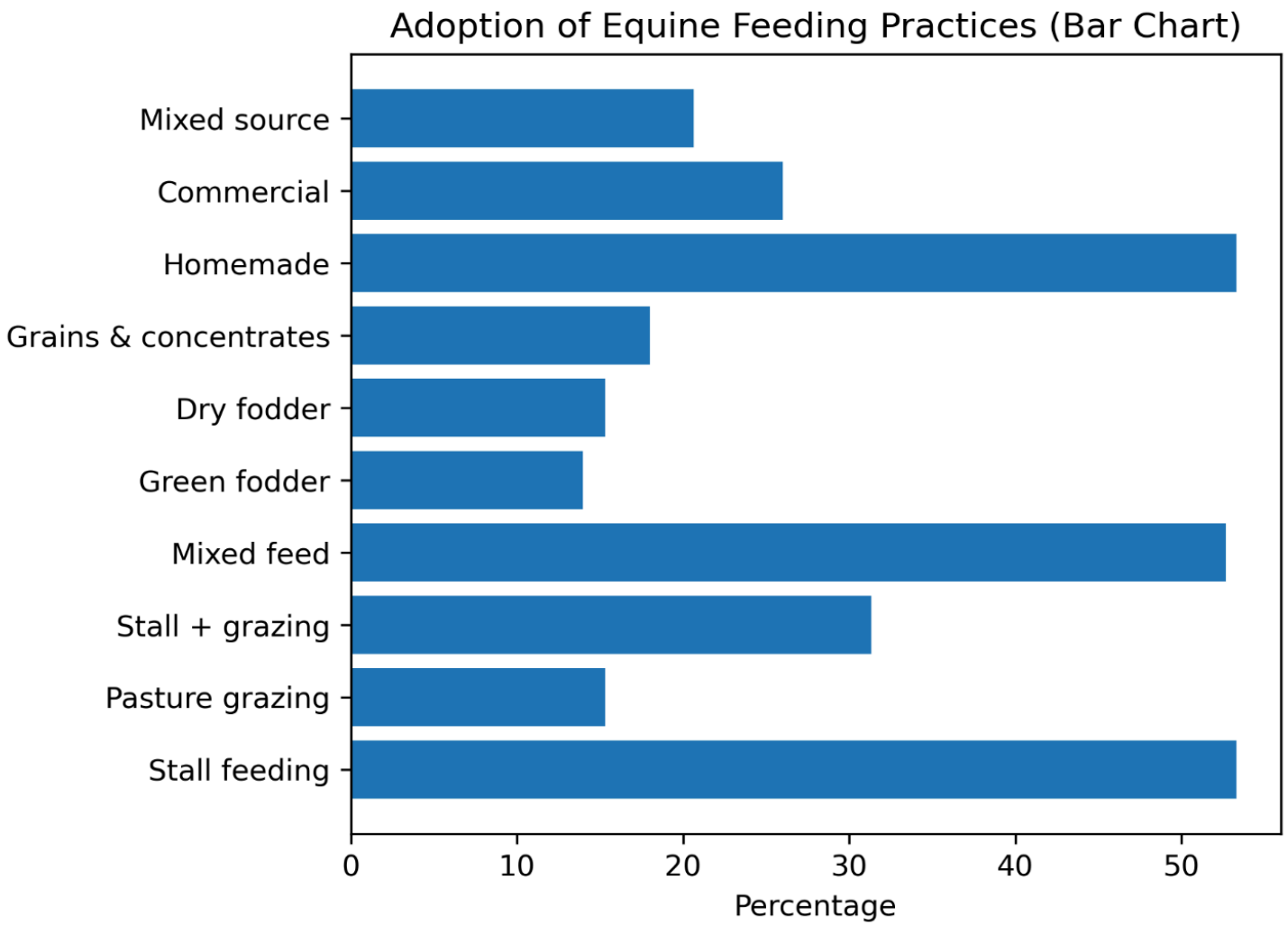


Figure 2

Graphical representation of adoption levels of equine feeding practices among horse owners in South Gujarat, India,

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