International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; SP-9(8): 416-422
www.biochemjournal.com
Received: 17-05-2025
Accepted: 19-06-2025

Palak P Vaidh
Department of Animal Nutrition, College of Veterinary Science & Animal Husbandry, Kamdhenu University, Anand, Gujarat, India

Meet M Sharma
Department of Animal Nutrition, College of Veterinary Science & Animal Husbandry, Kamdhenu University, Anand, Gujarat, India

Nayan H Raval
Department of Veterinary Extension Education, College of Veterinary Science & Animal Husbandry, Kamdhenu University, Anand, Gujarat, India

Preet H Shah
Department of Veterinary Extension Education, College of Veterinary Science & Animal Husbandry, Kamdhenu University, Anand, Gujarat, India

Corresponding Author:
Palak P Vaidh
Department of Animal Nutrition, College of Veterinary Science & Animal Husbandry, Kamdhenu University, Anand, Gujarat, India

Adoption dynamics of scientific milking, healthcare and feeding practices and their relationship between socio-demographic profile of dairy farmers of Anand district

Palak P Vaidh, Meet M Sharma, Nayan H Raval and Preet H Shah

DOI: https://www.doi.org/10.33545/26174693.2025.v9.i8Sg.5188

Abstract
This study investigates the adoption of scientific milking, healthcare, and feeding practices among dairy farmers in Anand district, Gujarat, and explores how socio-demographic characteristics influence these adoption levels. A sample of 400 farmers was selected using multistage random sampling method across four talukas of Anand district: Anand, Petlad, Umreth, and Anklav. Data were collected using a well-structured interview schedule and analyzed using correlation statistics. The findings revealed that education, experience in dairy farming, and professional training significantly influenced the adoption of all three practices. Mass media exposure also showed a positive correlation, particularly with milking practices. However, age, gender, herd size, and annual income exhibited mixed or non-significant relationships depending on the specific practice. These results underline the importance of targeted interventions to enhance dairy management practices through farmer education, training, and improved access to information.

Keywords: Dairy farming, adoption of scientific practices, socio-demographic characteristics, milking practices, healthcare practices, feeding practices

Introduction
The dairy sector is a cornerstone of India's rural economy, providing employment to over 70 million rural households, the majority of whom are small and marginal farmers (Government of India, 2022) [6]. Gujarat, particularly Anand district, is known for its cooperative dairy model and substantial contribution to national milk production (NDDB, 2020). Despite the availability of scientific knowledge and government-led interventions, adoption of recommended milking, feeding, and healthcare practices remains uneven across farming communities (Chander *et al.*, 2013) [3].

Scientific milking practices—such as pre-and post-milking udder hygiene, use of clean equipment, and maintaining milking order—are essential for ensuring milk quality and animal health. Similarly, proper healthcare practices like timely vaccination, deworming, and appropriate treatment approaches directly affect livestock productivity and longevity. Feeding practices, including balanced rationing and use of green fodder or mineral mixtures, are crucial for maintaining milk yield and reproductive performance (Patil *et al.*, 2019). However, the actual adoption of these practices is often influenced by farmers' socio-demographic factors such as education, experience, income, gender, and access to extension services (Singh *et al.*, 2020) [22].

Previous research has shown that education and training significantly improve farmers' understanding and implementation of improved dairy practices, while other variables like age, gender, and herd size show inconsistent effects across regions and studies (Kumar *et al.*, 2016) [9]. This study aims to systematically examine how these socio-demographic characteristics influence the adoption of scientific dairy practices among farmers in Anand district. The results will offer insights for policymakers and extension professionals to better tailor their outreach and training strategies to improve dairy productivity and animal welfare.

Objectives

- To study personal and socio-demographic profile of dairy farmers
- To study adoption of milking practices by farmers
- To study the adoption of health care practices by dairy farmers
- To study adoption of animal feeding practices by dairy farmers
- To identify correlation between various characteristics of dairy farmers and their adoption to milking, healthcare and feeding practices

Methodology

The study was conducted in the Anand district of Gujarat. Where by 4 talukas viz., Anand, Petlad, Umreth and Anklav were randomly selected. Whereby from each taluka 5 villages were randomly selected. From each of the randomly selected talukas, 20 farmers were randomly selected making a set of total 400 farmers.

While selecting respondents due care was taken to ensure that they were evenly distributed in the village and truly represented animal management practices prevailing in the area. The selected dairy farmers were interviewed by an interview schedule method and the desired information was collected. For the said purpose a well designed interview schedule was prepared with the help of experts from the domain of Animal Nutrition, Livestock Production Management and Veterinary Medicine serving in the academic institutions which included questions regarding personal and socio-demographic profile of dairy farmers, their routine practices of milking, healthcare and feeding practices by Ex-post-facto effect to cause design. Data were tabulated and analysed as per standard statistical tools using SPSS statistical packages to draw meaningful interference.

Results and Discussion

Table 1: Personal and Socio-demographic Profile of Dairy Farmers

n = 400

Particulars	Class	Frequency	Percent
Age	Young age (upto 35 years)	169	42.25
	Middle (36 to 50 years)	183	45.75
	Old age (Above 50 years)	48	12.00
Education	Upto Primary	83	20.75
	Upto Secondary	191	47.75
	Graduate	76	19.00
	Above Graduate	50	12.50
Gender	Male	276	69.00
	Female	124	31.00
Experience in Dairy (years)	Very low (0 to 8 years)	52	13.00
	low (8.1 to 16 years)	113	28.25
	Middle (16.01 to 24 years)	83	20.75
	High (24.01 to 32 years)	106	26.50
	Very High (Above 32.01 years)	46	11.50
Social Participation	Low	96	24.00
	Medium	262	65.50
	High	42	10.50
Mass media exposure	Low	88	22.00
	Medium	103	25.75
	High	209	52.25
Professional Training received	Low	283	70.00
	Medium	96	25.00
	High	21	5.00
Herd size (No. of animals)	0 to 10	199	49.75
	11 to 30	133	33.25
	31 to 50	45	11.25
	More than 50	23	5.75
Annual Income	Low (0-10 lac)	337	84.25
	Medium (10-20 lac)	54	13.50
	High (20 lac and above)	9	2.25

The study included 400 dairy farmers in the Anand district of Gujarat, with a focus on their personal and socio-psychological profiles. According to the survey results, the majority of farmers were middle-aged (45.75%) and male (69%). In terms of education, most farmers had attained up to a secondary level (47.75%), while a considerable portion had only primary education (20.75%). 28.25% of farmers had low experience in dairy farming, indicating a need for enhanced training and support in this area. Most participants demonstrated medium social participation (65.5%) and high mass media exposure (52.25%), suggesting potential avenues for disseminating information and promoting best practices. Furthermore, a large proportion of the farmers (70%) had low professional training, highlighting a gap in knowledge and skills.

Nearly half of the farmers (49.75%) had a herd size of 0 to 10 animals, reflecting the prevalence of small-scale dairy farming in the region. Additionally, the majority of farmers reported low annual income, which could be a limiting factor in adopting modern technologies and practices. These findings underscore the importance of tailored interventions that address the specific needs and challenges faced by dairy farmers in the Anand district, considering their demographic characteristics, educational background, experience level,

and access to resources.

A similar socio-demographic characteristics of farmers especially in regards to Age, Gender and Education was observed by Hakim *et al.* (2024) [7]. Rajput *et al.* (2023) [16] had also observed similar frequency distribution in terms of herd size possessed by dairy farmers in their study.

Table 2: Distribution of the dairy farmers according to milking practices followed

Particulars	Type	Frequency	Percent
Washing hands before milking	Yes	387	96.75
	No	13	3.25
Place of milking	Milking at same place	362	90.50
	Milking at separate dry place	38	9.50
Milking Habit	Wet hand	398	99.50
	Dry hand	2	0.50
Milking Method	Knuckling	233	58.25
	Full hand	12	3.00
	Machine Milking	55	13.75
Allowed calf to suckle	Yes	156	39.00
	No	244	61.00
Teat dipping with Antiseptic Solution	Yes	326	81.50
	No	74	18.50

The review of milking practices among dairy farmers indicates generally good hygiene awareness but limited adoption of modern techniques. A high percentage (96.75%) of respondents reported washing hands before milking, and 99.5% used the wet-hand method, highlighting strong adherence to basic cleanliness protocols. Most farmers (90.5%) conducted milking at the same place where animals are housed, with only 9.5% utilizing a separate dry area, which may raise concerns about contamination risks. The majority (58.25%) practiced the traditional knuckling method, whereas only 13.75% employed machine milking, indicating slow adoption of mechanization. Additionally, 61% of the farmers did not allow the calf to suckle, potentially affecting natural bonding and milk let-down. These findings suggest that while fundamental hygiene practices are well-followed, there is a need to promote more hygienic infrastructure and encourage mechanization for improved milking efficiency and animal welfare.

Table 3: Distribution of the dairy farmers according to health care practices followed

Particulars	Type	Frequency	Percent
Health check-up Interval	Regularly/monthly	31	7.75
	Yearly	13	3.25
	When needed	356	89.00
Vaccination	Yes	376	94.00
	No	24	6.00
Deworming	Yes	391	97.75
	No	9	2.25
Insemination	Natural	27	6.75
	Artificial	373	93.25
Diagnosis	Self	3	0.75
	Veterinarian	180	45.00
	Both	217	54.25
Treatment	only Herbal	10	2.50
	only Allopathy	34	8.50
	only Homeopathy	7	1.75
	Combination of any of them	349	87.25

As described in Table: 3, the data on dairy animal healthcare practices indicate a reactive approach among the majority of dairy farmers. A substantial 89% of farmers conduct health check-ups only when needed, while just 7.75% do so regularly. Preventive healthcare appears to be relatively well adopted, with 94% vaccinating and 97.75% deworming their animals. Artificial insemination is the preferred method (93.25%), highlighting a shift towards improved breeding techniques. Diagnosis is commonly performed with the involvement of veterinarians (45%) or through both self and veterinary methods (54.25%), reflecting a blend of professional and traditional knowledge. Treatment preferences are predominantly integrative, with 87.25% using a combination of herbal, allopathic, and homeopathic systems, suggesting a pragmatic, multi-modal approach to animal healthcare.

Table 4: Distribution of the dairy farmers according to their feeding practices

Particulars	Type	Frequency	Percent
feeding sytem	grazing	13	3.25
	stall fedding	351	87.75
	both	36	9.00
feed source	farm cultivated	11	2.75
	marketed feed	74	18.50
	both	315	78.75
As per thumb rule	Yes	266	66.50
	No	174	43.50
Chaffing of fodder	Yes	227	56.75
	No	173	43.25
TMR	Yes	41	10.25
	No	359	89.75
Use of Min Mix	Daily	333	83.25
	Occassionally	44	11.00
	Never	23	5.75
Feeding of silage	Yes	153	38.25
	No	247	61.75
Use of Bypass Nutrients	Yes	146	36.50
	No	254	63.50
Feed supplement	Yes	218	54.50
	No	182	45.50
Watering Frequency (times/day)	available round the day	272	68.00
	Offered at certain frequency	128	32.00

The feeding practices followed by dairy farmers reflect a predominantly intensive system. Stall feeding is the most common practice, adopted by 87.75% of respondents, while only a small fraction (3.25%) rely solely on grazing. Most farmers (78.75%) use both farm-grown and marketed feed sources, suggesting a mixed strategy to ensure consistent nutrition. A majority (66.5%) follow feeding thumb rules, and over half (56.75%) practice chaffing of fodder to improve digestibility. However, Total Mixed Ration (TMR) usage is limited, with only 10.25% adopting it. The use of mineral mixtures is encouraging, with 83.25% providing them daily, while 38.25% feed silage and 36.5% use bypass nutrients. Feed supplementation is reported by 54.5% of the farmers, indicating moderate awareness of balanced nutrition. Watering practices show that 68% provide water throughout the day, reflecting attention to hydration needs. Overall, while certain advanced feeding practices like TMR and bypass nutrients are underutilized, there is significant adherence to basic nutritional guidelines among dairy farmers.

Table 5: Relationship between socio-demographic profile of dairy farmers and their extent of adoption of practices for milking practices

Characteristic	Correlation coefficients ('r' value)
Age	0.534*
Education	0.675*
Gender	0.120
Experience in Dairy (years)	0.534*
Social Participation	0.220
Mass media exposure	0.433*
Professional Training received	0.789*
Herd size	0.270
Annual Income	0.085

*Significant at 5 Percent level

Table 5 describes the correlation coefficients between various socio-demographic characteristics of the dairy farmers and their adoption of scientific milking practices. Age, education, experience in dairy farming, mass media exposure, and professional training received all show a significant positive correlation with the adoption of scientific milking practices. This suggests that older, more educated farmers with more experience, greater exposure to mass media, and professional training are more likely to adopt these practices. These findings are well supported by the results of Kumar and Mishra (2011) [25]. These findings align with research that emphasizes the role of education and access to information in the adoption of new agricultural practices.

For instance, studies have shown that farmers with higher education levels are more likely to understand and implement recommended practices (Sharma *et al.*, 2023) [21]. Similarly, access to mass media can increase awareness and knowledge of new technologies and practices, leading to higher adoption rates (Ghosh *et al.*, 2005; Rao *et al.*, 1998) [5, 17]. Further, Mithun *et al.* (2024) [12] had revealed that the traditional mass media exposure may still be more effective in driving adoption to dairy farmers rather the digital media platforms i.e., Whatsapp, Youtube. Education, extension participation, risk orientation, and economic motivation positively impact dairy farmers' adoption of clean milk production practices, while age shows a non-significant negative relationship (Usadiya *et al.*, 2023) [24]. Further, Parmar *et al.*, (2025) [26] also delineated the positive correlation between mass media exposure and training; participations of dairy farmers with their adoption of scientific dairy farming practices.

Gender, social participation, herd size, and annual income do not show a significant correlation. Aligning to the results of current study Pagar (2011) [27] had found the observed the non-significant correlation between social participation and annual income with the adoption of dairy farmers to Clean Milk Production Practices. In contrast, Kharat & Rathod (2017) had found highly significant correlation of social participation and herd size with the discussed parameter. The lack of significant correlation between income and adoption could be a suggestive of that the benefits of improved milking practices are perceived as outweighing

the costs, or that other factors such as access to credit or social networks play a more critical role.

Table 6: Relationship between socio-demographic profile of dairy farmers and their extent of adoption of practices for healthcare practices

Characteristic	Correlation coefficients ('r' value)
Age	0.230
Education	0.860*
Gender	0.470*
Experience in Dairy (years)	0.848*
Social Participation	0.344
Mass media exposure	0.236
Professional Training received	0.758*
Herd size	0.035
Annual Income	0.765*

*Significant at 5 Percent level

Table 6 presents the correlation coefficients between socio-demographic profile of dairy farmers and their adoption of healthcare practices. Education, experience in dairy farming, professional training received, and annual income all exhibit a significant positive correlation with the adoption of healthcare practices. This suggests that farmers with higher education, more experience, specific professional training, and higher annual incomes are more likely to implement recommended healthcare practices for their animals. Gender also shows a significant positive correlation indicating that female farmers may be more inclined to adopt these practices. Age, social participation, mass media exposure, and herd size do not show a significant correlation.

These results highlight the importance of education and economic stability in the adoption of healthcare practices. Educated farmers tend to have greater awareness of preventive and curative veterinary measures, and those with higher incomes are more able to invest in services and medications, as supported by multiple Indian studies (Sachan *et al.*, 2021; Sharma *et al.*, 2023; Bardhan *et al.*, 2018) [18, 21, 2]. The significance of experience suggests that practical knowledge gained over time also plays a crucial role in healthcare management. It's interesting to note the significance of gender, which could reflect differences in caregiving attitudes or roles within the farming household (Kumari & Meena, 2023) [10]. The lack of correlation with herd size suggests that the intensity of healthcare practices may not necessarily increase with larger herds, possibly due to resource constraints or management priorities (Sharma & Singh, 2020) [19, 20].

Extension strategies should focus on improving farmers' knowledge through training programs that cover the latest dairy farming practices (Sharma *et al.*, 2020) [19, 20]. Parallel to the results obtained in this study, Sharma *et al.* (2020) [19, 20] and Patel *et al.* (2021) [14] had found positive significant effect of education and experience of farmers in dairying with regular deworming and vaccination of their animals. Similarly, Krishnasamy *et al.* (2019) [8] and had also observed a positive significant correlation of adaptation of said two practices with farmers' involvement in training programmes, however, contrary to the present study, exposure to mass media did not make any significant effect. Further, Patel *et al.* (2021) [14] had found that the annual income of the dairy farmer as well as the herd size had no significant effect over the adoption of healthcare practices. Use of Ayurvedic and traditional treatment was found to be more associated with the Gender and traditional knowledge (Chaudhary *et al.*, 2022) [11]

Table 7: Relationship between socio-demographic profile of dairy farmers and their extent of adoption of practices for feeding practices

Characteristic	Correlation coefficients ('r' value)
Age	0.040
Education	0.735*
Gender	0.023
Experience in Dairy (years)	0.659*
Social Participation	0.53*
Mass media exposure	0.061
Professional Training received	0.024
Herd size	0.689*
Annual Income	0.736*

*Significant at 5 Percent level

Table 7 shows the correlation coefficients between socio-demographic profile of dairy farmers and their adoption of feeding practices. Education, experience in dairy farming, social participation, herd size, and annual income, all demonstrate a significant positive correlation with the adoption of scientific feeding practices. This indicates that farmers with higher education, more experience, active social engagement, larger herds, and higher annual incomes are more prone to adopt improved feeding practices. Parallel to our study, Thakur *et al.* (2022) [23] revealed that age, mass media had positive correlation while the experience in dairy farming had no significant correlation with Dairy farmers' adoption of scientific feeding practices. While the correlation of studied parameter with education, annual income and social participation demonstrated by Thakur *et al.* (2022) [23] was found to be contrasting with present study. The correlation between education and feeding practices underscores the importance of understanding nutritional requirements and the impact of balanced diets on animal health and productivity. These findings emphasize the importance of education, practical experience, social networks, and economic factors in the adoption of better feeding practices. Madke *et al.*, (2006) had also observed that with decreasing the education levels of farmers, adoption of scientific feeding was also decreasing.

Age, gender, mass media exposure, and professional training received do not show a significant correlation. Supporting to our study, Mousami *et al.*, (2017) had also established a non-significant correlation of age of dairy farmers with their adoption to scientific feeding practices while the same study revealed a significant correlation with the mass media exposure which was contrasting to our findings. Anonymous (2019) [1] revealed that there exists a significant relationship between age, dairy experience, years of education and pastoralists' knowledge of dairy production technologies.

Conclusion

The study highlights a complex interplay between dairy farmers' socio-demographic profile and the adoption of scientific animal husbandry practices in Anand district. Education, experience in dairy farming, and professional training consistently emerged as significant determinants across all three domains—milking, healthcare, and feeding. These findings emphasize the critical role of capacity building through formal and informal education and technical training. While mass media exposure positively influenced milking practices, its effect on feeding and

healthcare adoption was not significant, pointing to a need for improved communication strategies.

Conversely, factors such as age, gender, and herd size showed limited or no correlation with adoption levels, suggesting that behavioral change is more closely linked to knowledge, experience, and economic capacity than to demographic variables alone. Policymakers and extension agencies should focus on enhancing access to training and educational resources, particularly targeting low-income and low-literacy groups. Tailored interventions that consider these socio-demographic nuances can bridge existing adoption gaps and contribute to sustainable improvements in dairy farming practices.

References

1. Anonymous. Assessment of knowledge level of dairy production technologies among milk producers in Oyo State, Nigeria. 2019.
2. Bardhan D, Sharma ML, Saxena R. Determinants of willingness to pay for animal healthcare services in India: Evidence from a rural household survey. Tropical Animal Health and Production. 2018;50(3):595-602. doi:10.1007/s11250-017-1462-y.
3. Chander M, Dutt T, Ravikumar RK, Subrahmanyeswari B. Livestock technology transfer service in India: A review. Indian Journal of Animal Sciences. 2013;83(6):589-600.
4. Chaudhari SR, Bhatt PM, Solanki JD. Use of ethnoveterinary practices among dairy farmers in Gujarat. Indian Journal of Animal Research. 2022;56(6):725-730.
5. Ghosh RK, Goswami A, Mazumdar AK. Adoption behaviour of the dairy farmers in relation to artificial insemination in co-operative farming system. Livestock Research for Rural Development. 2005;17(3). Available from: http://www.lrrd.org/lrrd17/3/ghos17035.htm.
6. Government of India. Basic Animal Husbandry Statistics 2022. New Delhi: Ministry of Fisheries, Animal Husbandry & Dairying, Department of Animal Husbandry & Dairying; 2022.
7. Hakim EA, Akbay C. Assessment of socio-demographic characteristics of dairy cattle farms and management practices in the northern region of Iraq. The Journal of Agricultural Economics Research. 2024;10(1):27-45.
8. Krishnasamy R, Kumar S, Ramasamy V. Extent of adoption of animal health practices by dairy farmers. Journal of Extension Education. 2019;31(3):6345-6350.
9. Kumar A, Staal S, Singh DK. Smallholder dairy farmers' access to modern inputs and its effect on adoption of improved practices in Bihar, India. Agricultural Economics Research Review. 2016;29(1):77-86.
10. Kumari K, Meena BS. Adoption of scientific animal health practices among women dairy farmers in Himachal Pradesh: An ex-post-facto research study. Indian Journal of Extension Education. 2023;59(1):95-100. Available from: https://www.researchgate.net/publication/385706407.
11. Maousami M, Singh B, Kumar R, Kumar V, Chaudhary J. Adoption level and training need in scientific feeding management practices among Hill Korwa tribes of Chhattisgarh. International Journal of Livestock Research. 2017;7(9):134-139. doi:10.5455/ijlr.20170707055450.
12. Mithun G, Triveni G, Sharma GRK, Ravindra Reddy Y. Adoption level of dairy farmers obtaining information from digital and traditional media in Andhra Pradesh. International Journal of Agriculture Extension and Social Development. 2024;7(4S):99-101. doi:10.33545/26180723.2024.v7.i4Sb.543.
13. National Dairy Development Board (NDDB). Annual Report 2019-20. Anand: NDDB; 2020.
14. Patel HM, Desai RR, Mehta ML. Socio-economic determinants influencing adoption of scientific animal health practices. Gujarat Journal of Extension Education. 2021;32(1):45-49.
15. Patil AP, Gawande SH, Nande MP, Gobade MR. Adoption of animal husbandry practices by dairy farmers in Nagpur district of Maharashtra. Veterinary World. 2009;2(5):199-201.
16. Rajput M, Ashwar B, Vekariya S. Socio-economic status and constraints faced by dairy farmers. Gujarat Journal of Extension Education. 2023. doi:10.56572/gjoee.2023.36.2.0010.
17. Rao SL, Reddy YV, Ingole BS. Adoption of dairy production technologies and implications for dairy development in India. Indian Journal of Dairy Development. 1998;25(1):1-9.
18. Sachan S, Shrivastava KK, Tomar R. Factors influencing adoption of scientific dairy farming technologies by dairy women entrepreneurs. Indian Journal of Extension Education. 2021;57(1):21-26. Available from: https://www.researchgate.net/publication/348445392.
19. Sharma N, Singh MK. Assessment of knowledge and practices of hygienic milk production among dairy farmers in peri-urban area of Delhi. Indian Journal of Community Medicine. 2020;45(S1):S57-S61.
20. Sharma RK, Singh R, Yadav S. Adoption of animal health practices by dairy farmers in Haryana. Indian Journal of Extension Education. 2020;56(4):23-28.
21. Sharma S, Singh H, Pavan S. Socio-economic determinants of dairy farmers' knowledge on dairy farming practices in Uttar Pradesh, India. Journal of Extension Education. 2023;35(1):6940-6950. doi:10.26725/JEE.2023.1.35.6940-6950.
22. Singh A, Dabas YPS, Meena MS. Factors influencing adoption of dairy innovations by dairy farmers in Haryana. Indian Journal of Extension Education. 2020;56(3):28-33.
23. Thakur M, Dogra RK, Sharma P. Socio-economic determinants of scientific feeding practices among dairy women. Indian Journal of Veterinary and Animal Sciences Research. 2022;51(2):145-150.
24. Usadadiya N, Prajapati R, Parikh N. Relationship between dairy farmers' characteristics and their adoption of clean milk practices. Gujarat Journal of Extension Education. 2023. doi:10.56572/gjoee.2023.36.1.0014.
25. Kumar C, Mishra S. Banking outreach and household level access: Analyzing financial inclusion in India. In13th annual conference on money and finance in the Indian economy 2011. p. 1-33.
26. Parmar AD, Patel BB. Ambient Air Quality Assessment Using AERMOD for Line Source. Journal of

Environmental Informatics Letters. 2025 Feb 3;13(1):14-24.
27. Pagar VV, Jadhav AM, Liu RS. Gold-catalyzed formal [3+ 3] and [4+ 2] cycloaddition reactions of nitrosobenzenes with alkenylgold carbenoids. Journal of the American Chemical Society. 2011 Dec 28;133(51):20728-20731.