RESEARCH ARTICLE Indian Journal of Animal Research, Volume 59 Issue 6: 1045-1053 (June 2025)

Assessment of Animal Feeding Practices by Livestock Farmers in the Kingdom of Saudi Arabia

Mansour H. Al-Mutairi[1], Khadran H. Al-Zahrani[1], Hazem S. Qassem[1], Mohammed A. Al-Badwi[2], Hani Hasan Al-Baadani[2], Ibrahim A. Alhidary[2]

10.18805/IJAR.BF-1912

ABSTRACT

Background: Saudi Arabia is one of the Arab countries with the greatest interest in livestock breeding projects to meet its demand for animal products. Feeding costs account for up to 70% of total costs. The aim of this study is to evaluate the feeding practices of livestock farmers and producers and to identify the differences in production efficiency depending on the feeding systems used.

Methods: A total of 108,901 livestock farmers were randomly selected from the Ministry of Environment, Water and Agriculture directory. Of these, 442 respondents answered a questionnaire on general information (age, gender, educational background, income, occupation, location of livestock distribution and purpose of animals), feeding regimes followed, the use of concentrates diet with their animals and welfare concern.

Result: About 58.9% of the samples respondents were male and the ages of them were under 37 years (48.9% of the samples) and educational background was secondary school (34.4%), with less than 12 years of experience (41%), they were the majority of the study members. The main occupation for most of the studied samples (83.0%) was livestock farming with monthly income less than 5000 SR (75.2%). Most farmers owned sheep (82.2%) and 16.1% were located in the Riyadh region and 59.5% in the Badia system. The main purpose of rearing was for commercial use (38%). In terms of feeding systems, most farms used only green fodder (34.6%) or only barley (87.1%) or green fodder and barley (32.4%). 86.9% did not prefer to use concentrate diet, but 34.3% were willing to use a concentrate diet. The most common health problems associated with the use of concentrated diets (37.1%) were changes in meat color. All of these results represent the majority of study participants. The results strongly suggest that there is significant potential to improve production efficiency by introducing more balanced and optimized feeding strategies. This could include the use of well-formulated concentrates, improved feed quality and variety and the use of more efficient feeding techniques.

Key words: Animal farmers, Concentrate diet, Feeding practices, Forage, Livestock sector.

INTRODUCTION

Globally, the demand for animal products has increased in developing countries due to population growth (Tiseo *et al.,* 2020; Alhidary *et al.,* 2024). According to Makkar *et al.* (2016) and Henchion *et al.* (2021), the demand for meat is expected to increase to 455 million tons and for dairy products to 1077 million tons by 2050. Livestock is a driving force for food security and sustainable development by converting low-value materials that are inedible or unpalatable th humans, into valuable products such as milk, meat and eggs (Abu Hatab *et al.,* 2019; Mohammed *et al.,* 2024). The cost of animal feed accounts for 70% of the total cost of livestock farms and can increase in intensive or closed projects (Linde *et al.,* 2002). On the other hand, the materials used in animal feed formulation have an impact the environment as well as on human food security and health (Makkar *et al.,* 2018). In addition to previous reasons, they could be economically costly and affect the availability of water (Muruz *et al.,* 2024). Therefore, we need to evaluate the animal feeding practices by farmers or those responsible for livestock projects.

In developing and developed countries, many livestock production systems are rapidly evolving to meet the rapidly increasing demand for animal products while improving their efficiency and environmental sustainability (Thornton, 2010). From this point of view, one of the main challenges is to maintain a balance between livestock production systems and best practices for more sustainable livestock management and on the other hand, the production of the environment, especially land and water, as well as competition between food and rations between humans and animals (FAO, 2023). Globally, recent trends in livestock production systems have focused on the benefits of feed

[1]Department of Agricultural Extension and Rural Community, College of Food and Agriculture Sciences, King Saud University, P.O. Box 2460, Riyadh 11451, Kingdom of Saudi Arabia.
[2]Department of Animal Production, College of Food and Agriculture Science, King Saud University, P.O. Box 2460, Riyadh 11451, Kingdom of Saudi Arabia.

Corresponding Author: Hani Hasan Al-Baadani, Department of Animal Production, College of Food and Agriculture Science, King Saud University, P.O. Box 2460, Riyadh 11451, Kingdom of Saudi Arabia. Email: hsaeed@ksu.edu.sa
ORCID: 0000-0003-3994-9216

How to cite this article: Al-Mutairi, M.H., Al-Zahrani, K.H., Qassem, H.S., Al-badwi, M.A., Al-Baadani, H.H. and Alhidary, I.A. (2025). Assessment of Animal Feeding Practices by Livestock Farmers in the Kingdom of Saudi Arabia. Indian Journal of Animal Research. 59(6): 1045-1053. doi: 10.18805/IJAR.BF-1912.

Submitted: 29-10-2024 **Accepted:** 16-01-2025 **Online:** 10-02-2025

resources and feed products and the promotion of innovative ways to reduce losses in feed production (Robinson *et al.,* 2011). The Codex Alimentations Commission (FAO) has issued a guide to good practices in the feeding of animals at each stage of the feed production process and in the feeding of animals by farmers and producers (Codex Alimentarius, 2004; Farkas and Mohácsi-Farkas, 2011).

The number of sheep in Saudi Arabia is ~21 million head, goats ~6.5 million head, camels 1.5 million head, cows 302000 head and 5 million poultry and birds (GASTAT, 2020); therefore, the Kingdom of Saudi Arabia is making great efforts to develop the agricultural sector, both in crops and livestock. As part of sustainable development, global food security and environmental preservation through the Saudi Food and Drug Authority (SFDA) and the Ministry of Environment, Water and Agriculture. Farmers face the challenge of selecting and using appropriate feed for livestock that is in line with sustainable development. This includes maintaining nutritional competition between humans and animals and preserving the environment in line with global trends. This problem may also be due to not using appropriate feed for the animals that meets their nutritional needs. Other reasons include the culture of farmers and producers with regard to feeding the animals. In addition, there are reasons related to the feed itself, such as poor quality and quantity that do not meet the animal's production output, or feed mills that use inferior feed (MEWA, 2020; MEWA, 2021).

The livestock sector in Saudi Arabia faces various challenges, including inefficient feeding practices that have negatively impacted animal welfare, productivity and overall sustainability. These problems are exacerbated by limited access to quality feed, inadequate knowledge of animal nutrition and traditional feeding practices that may not be optimal for the needs of modern livestock production. While some studies have examined specific aspects of livestock production in Saudi Arabia (Ahamed *et al.,* 2023; Alnafissa *et al.,* 2024), a comprehensive assessment of livestock farmers' feeding practices remains a critical research gap. Therefore, understanding current practices, identifying knowledge gaps and assessing the impact of these practices on animal performance and environmental sustainability are crucial for developing effective strategies to improve the efficiency and resilience of the sector. The aim of this study is therefore to assess the feeding practices of livestock farmers and producers and to identify the differences in production efficiency depending on the feeding systems used.

MATERIALS AND METHODS

Sampling was done in accordance with the procedures established by the Scientific Research Ethics Committee, King Saud University, Saudi Arabia (Ethics Reference No.: KSU-SE-21-758).

Research design

This study used a qualitative approach using field notes, individual interviews and questionnaires administered to 442 participants out of 10,901 eligible individuals. This study was conducted from 2023-04 to 2024-08 among livestock farmers in the Kingdom of Saudi Arabia, which comprises thirteen administrative regions (GASTAT, 2020).

Samples

The sample involved in this study comprised all livestock farmers in the Kingdom of Saudi Arabia, whose number is about 108.901 in the Kingdom (GASTAT, 2020). Purposive sampling was about 395 farmers in this study and the purposive sampling criteria are as in the Yamane equation (Yamane, 1967).

$$n= N / [1+N (e2)]$$

Therefore, after reviewing the collected questionnaires, 442 questionnaires were collected and accordingly, the sample size consisted of 442 farmers.

Instruments and procedure

The data was collected by distributing a questionnaire in this study, which included the following questions: general data and personal characteristics, practices related to animal feeding, traditional feeding and feed formulated. The pilot study was conducted by applying the questionnaire to 15 livestock farmers and thus the questionnaire in its final form became valid for collecting field data. In addition, we used a double-entry logbook to analyze the data, which allows the observation to be isolated from bias. Aside from that, data was processed into a quantitative form that is valid for statistical analysis.

Statistical analysis

The qualitative answers obtained from questionnaires were transformed into categorical variables and descriptive data analysis was conducted on numerical and categorical values. The data were analysed using a one-way analysis of variance on the Statistical Package for the Social Sciences (SPSS, v. 26; IBM, USA) to determine differences in the nutrition systems practices used by the respondents and a simple regression test in determining the relative contribution of personal and social variables as independent variables in the interpretation of the variance in the application of educators feeding practices (dependent variable). The descriptive analysis included frequencies, arithmetic means, percentages and standard deviation to describe the study variables. Aside from that, the score obtained by the farmers' answers was assigned points varying from the most important (value = 1) to the least important (value = 2, 3, 4, 5). Furthermore, the total score was calculated as one divided by the value obtained by each obtained answer and all answers were summed.

RESULTS AND DISCUSSION

To understand the demographic profile of our study participants, we analyzed their age, gender, education level and primary occupation. The 108.901 eligible individuals, 442 participants, were used in this study. The proportion of testing was higher in the interval ≤ 37 years (48.9%), while

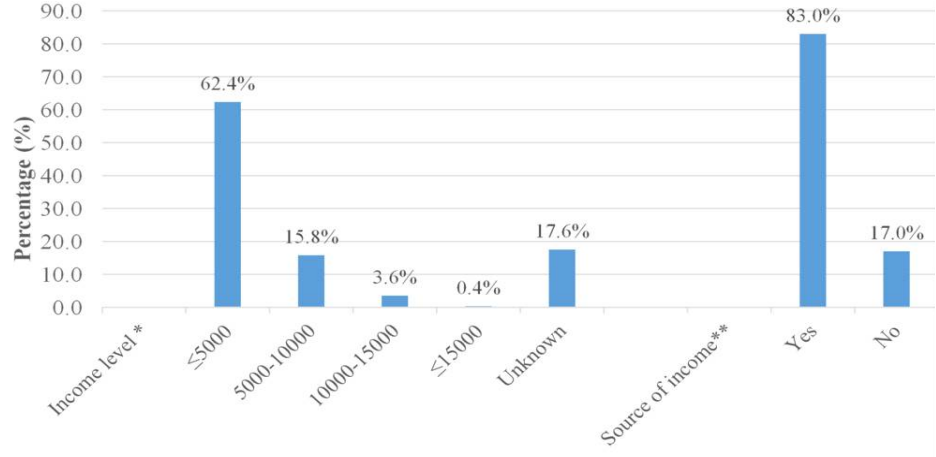
it was lower in individuals aged 38-55 years (29.2%), 56-72 years (10.9%) and 2% older than 74 years (and in individuals aged <15 years). Men (58.9%) were higher compared to 41.1% of women in the total sample. The results of this nationwide farmer questionnaire study indicate that the proportion of males in the total sample is 58.9%, especially among younger individuals aged ≤37 years in Saudi Arabia. This is due to the demand of this category for livestock farming, which requires a type of work that deals with raising animals and selling them in the markets and therefore they are best able to meet the requirements of this profession. Table 1 shows that the majority of the participants 34.2% of the respondents have a secondary education, 23.5% have a university education, 19.0% had their education in an elementary stage and 13.8% can neither read nor write. Only 0.9% of the sample had higher education. Furthermore, livestock farming is the main occupation for 61.3% of the study participants and represents the largest group of study participants. 13.8% have other occupations, while 12.0% work full-time in the public sector in addition to livestock farming, 8.8% are retired and only 4.1% are employees in the private sector. The variables for educational background and occupation indicate that livestock farmers have a high level of education and awareness. Our results are in contrast to the findings of study by Kasima (2019), which found that most pastoralists are illiterate and poor. This may be due to some factors such as regional differences, socio-economic changes and government policy development that may have affected the level of education and knowledge of livestock farmers. However, a small percentage of those who cannot read and write belong to the previous generation and those who have been in the livestock sector for many years and this is consistent with our findings for the different age groups and genders. According to our data, this decrease in education level leads them to be less interested in and aware of the livestock feeding system and the safety of the feed they use for their livestock, as found in the study by Kasima (2019).

To understand the economic impact of livestock farming, we analyzed the monthly income of our study participants. Fig 1 shows the distribution of participants according to the variable of monthly income from livestock. The analysis of monthly income revealed that a significant proportion of participants (62.4%) earned less than 5000 Saudi riyals per month from livestock farming. This finding highlights the economic challenges faced by many pastoralists in the region. Despite the low income, a substantial number of participants (83.0%) identified livestock rearing as their main source of income. This indicates that livestock farming plays an important role in rural livelihoods, even though it is not necessarily highly profitable. The low income can be attributed to several

Table 1: Distribution of the study participants according to the education background and occupation variable.

Variables	Frequency	Percentage (%)
Education background		
No education	61	13.8
Primary/elementary	84	19.0
Intermediate stage	38	8.6
Secondary/comprehensive	151	34.2
Tertiary/university	104	23.5
Postgraduate	4	0.9
Total	442	100
The occupation*		
Government employee	53	12.0
Private employee	18	4.1
Retired	39	8.8
Raising livestock	241	61.3
Other	61	13.8
Total	442	100

* The basic occupation besides raising livestock.



* Themonthly income come from raising livestock only. ** The livestock as a main source of income.

Fig 1: Ditribution of the study participants according to level and source variable .

factors, including high input costs, low market prices and limited access to credit and technology. To improve the economic viability of livestock production, these challenges need to be addressed and strategies implemented to increase farmers' income. This could mean promoting the adoption of improved feeding and breeding practices, facilitating access to markets and providing financial support to farmers. Our findings are consistent with previous studies, such as Subrahmanyeswari and Mahesh (2008), which have highlighted the importance of livestock rearing in rural households. In addition, the results showed that the main objective of livestock breeding has a positive impact on improving the sustainable livelihoods of rural families and increasing income and food security (Young *et al.,* 2014). However, it is important to note that the specific economic context and challenges faced by livestock farmers may vary across different regions and countries.

To understand the spatial distribution of livestock farming practices, we analyzed the geographical location of the study participants' livestock (Table 2). We find that the majority of the study sample (16.1%) were located in Riyadh region, 14.9% of their geographical area was Makkah region, 12.7% of their livestock were in Asir region, 10.0% had their livestock in Jazan region and 9.7% of the total study had their cattle in Al-Madinah region. The geographical distribution of livestock farming practices revealed that a significant proportion of participants (59.5%) raised their livestock in the Badia. This trend can be attributed to several factors, including the availability of extensive grazing lands, traditional nomadic practices and government policies that have historically favored pastoralism. In addition, 25.1% of the total study sample raises livestock in pens outside the cities, 13.6% raises livestock on farms and 1.8% raises livestock in sheds near the location of sheep marketing. It is clear that livestock raising exists in all regions of the Kingdom, but in varying proportions. The Riyadh region constitutes the highest percentage for being the capital of the Kingdom and the most populous. As well as the region of Makkah and Madinah and this is due to the consideration of these areas within the scope of the holy sites, Hajj and Umrah, to meet the ritual sacrifice and expiations. The Badia were the

Table 2: Distribution of the study participants according to location variable.

Location*		Frequency	Percentage (%)
Livestock area	Riyadh	71	16.1
	Al Qasim	81	4.1
	Medina	43	9.7
	Makkah	66	14.9
	Al-Sharqiyyah	16	3.4
	Aseer	56	12.7
	Northern Borders	35	7.9
	Al-Ba%ah	12	2.7
	Al-Jawf	2	0.5
	Tabuk	17	3.8
	Jizan	44	10.0
	Hail	24	5.4
	Najran	39	8.8
	Total	442	100
Livestock system	Badia	263	59.5
	Urban (Special)	60	13.6
	**A barn	8	1.8
	***Sheds	111	25.1
	Total	442	100

* The livestock farming areas. ** Barns is near sheep market. ***Sheds is outside the cities.

Table 3: Distribution of the study participants according to type of livestock.

Livestock		I have	Don't have	No responses	Total
Camel	Total	93	329	20	442
	%	21.1	74.4	4.5	100
Sheep	Total	363	59	20	442
	%	82.2	13.3	4.5	100
Goat	Total	280	142	20	442
	%	63.3	32.2	4.5	100
Cow	Total	29	393	20	442
	%	6.6	88.9	4.5	100

majority of locations for raising livestock due to the ease of movement and grazing and the distance from urban sprawl. This is consistent with what Henein *et al.* (2021) reported: 28% of livestock breeders do not own agricultural land to raise their livestock and animals are raised in the Badia.

Table 3 represents the distribution of the study sample according to the type of livestock owned by the farmers. The majority of the farmers (82.2%) own sheep and 63.3% of them own goats, while camels (21.1%) come in third place in terms of live-stock breeding in the kingdom. However, 6.6% of the total samples, their livestock were cows, which was the last rank in the livestock raising. However, the analysis of livestock ownership revealed that sheep and goats were the most commonly owned livestock species, accounting for 82.2% and 63.3% of the total sample, respectively. This trend can be attributed to several factors, including the cultural significance of sheep and goat meat, their adaptability to arid conditions and their role in providing milk and other products. These results agreed with what Henein *et al.* (2021) found, as he indicated that the vast majority (93% of farmers' holdings were sheep and goats).

Table 4 shows the distribution of the study sample s according to the variable of purpose of livestock raising; 38.0% of purpose is for trading and increasing the source of income and they were the majority of the study sample members. Of 26.2% of the purpose was a hobby and not for a commercial purpose, 14.9% for meat production, 11.2% for other commercial purposes, 6.8% of samples were interested in raising livestock for fattening and only 2.7% of them raise their livestock because of milk production. Through the results shown in Table 5, which show the years of experience in raising livestock, it is clear that the majority of the study samples (41.0%) represent their years of experience of 12 years and less, followed by the 39.8% having experiences from 13-31 years, the 6.6% were from 32-51 years and only 2.0% have experience in raising livestock for more than 52 years. From the results,

Table 4: Distribution of the study participants according to purpose variable.

The purpose*	Frequency	Percentage (%)
Commercial	168	38.0
Beauty (Anecdotes)	1	0.2
Fattening	30	6.8
Milk production	12	2.7
Meat production	66	14.9
Hobbies	116	26.2
Other	49	11.2
Total	442	100

* The purpose of raising livestock.

Table 5: Distribution of the study participants according to experience variable.

The experience*	Frequency	Percentage (%)
≤ 12	181	41.0
13-31	176	39.8
32-51	29	6.6
≤ 52	9	2.0
No response	47	10.6
Total	442	100

* The number of years of experience in raising livestock; Mean± 17 years; Standard deviation = 12.5; Maximum = 70 years and minimum = 1 year.

Table 6: Distribution of the study participants according to type of feeding systems, green fodder, grain and concentrate materials variable.

Variables		Frequency	Percentage (%)
Feeding systems	Grazing and green fodder	89	20.1
	Green fodder and barley	143	32.4
	Concentrates feeds	89	20.1
	Compound feed + green fodder	121	27.4
	Total	442	100
Green fodder	Green Alfalfa	122	34.6
	Dry Alfalfa	55	15.6
	Chloris gayana	21	5.9
	Sudanese grass	4	1.1
	Pelobionic	2	0.6
	Panicum	1	0.3
	Sorghum	2	0.6
	Mix	145	41.1
	No responses	1	0.3
	Total	353	100
Grain type	Barley	230	87.1
	Wheat	3	1.1
	Oats	4	1.5
	Mix	27	10.3
	Total	264	100

it is clear that 38.0% of the total study participants mainly depend on livestock breeding as a main source of income. In addition, they have a long experience and a close association with livestock.

Table 6 shows the distribution of the study participants according to type of feeding systems, green fodder, grain and concentrate materials variable. The current study shows that the majority of the study sample members represent (32.4%) of the total samples who consider the approved feeding system for livestock, including barley and green fodder and 27.4% followed for their livestock, which was compound feed and green fodder. However, 20.1% of them and their livestock depend equally for their food on grazing and purchasing green fodder and concentrate feeds only. It means that most farmers used green fodder and barley rather than other system feeding. According to the type of forage that was used for the feeding system, the majority (34.6%) of the sample fed their livestock on green Alfalfa, 15.6% of farmers used green Alfalfa and 5.9% of the total samples used Chloris gayana. It was found that there were varying small percentages of the study sample that use other forage, including Sudanese grass, Panicum, sorghum and Pelobionic. According to the type of grain, our results indicated that 87.1% of the total studied sample preferred barley to feeding their animals and 10.3% of them used more than one type of grain by their livestock. In addition, only 1.5% used oats to feed livestock and 1.1% of the sample used diet wheat for feeding. The results showed that the main sources of green fodder and barley were traditional feeding methods, consistent with what Al-Mutairi *et al.* (2023) said that feeding livestock is mostly traditional. Additionally, our results found that most of the participants in the experiment used barley (87.1%); which aligns with Salama *et al.* (2019), who noted that farmers prefer feeding on cereals directly without making any processing.

Table 7 show the distribution of the studied sample according to the concentrate type, which was used for feeding livestock. The majority of farmers (86.9%) did not prefer using concentrate rations for feeding their animals. On the other hand, 5.9% of the total study samples liked to use concentrates (yellow corn) in their own feeding systems; 3.4% of the total samples used more than one

Table 7: Distribution of the study participants according uses of concentrates type, mix used and Premix use variable.

Variables		Frequency	Percentage (%)
Concentrates type	Soybean	14	3.2
	Yellow corn	26	5.9
	Cotton seeds	3	0.6
	Mix	15	3.4
	Don't used	384	86.9
	Total	442	100
Mix used*	Yes	203	45.9
	No	239	54.1
	Total	442	100
Premix use**	Yes	116	57.1
	No	87	42.9
	Total	203	100

* More than one type ** A premix is a mixture of vitamins, trace minerals, medicaments, feed supplements and diluents. Only people use concentrates feeds.

Table 8: Distribution of the study participants according to period's, willingness and health problems use of concentrates feeds.

Variables		Frequency	Percentage (%)	Total
Periods	Interval			442 (100%)
	1-2	71	16.1	
	3-4	37	8.4	
	5-7	28	6.3	
	≤ 7	74	16.7	
	Don't used	232	52.5	
Willingness	Existent			210 (100%)
	Yes	138	34.3	
	No	72	29.7	
Health* problems	Existent			442 (100%)
	Yes	164	37.1	
	No	278	62.9	

* More than one health problems.

type of concentrate in feeding livestock; 3.2% of them used soybeans as a type of concentrate and only 0.6% of people used cotton seeds for animal diets. The finding indicates that a significant portion of the study participant, specifically 54.1%, do not prefer to use mixed feed for their livestock and this group represents the largest category within the study. On the other hand, 45.9% of them answered the questionnaire with using mixed feeding (yes), meaning that they mix feed to feed livestock. Regarding premix using a feed additive, which includes vitamins and mineral salts, the 57.1% of the total study sample members responded with answering (yes), while we find that 42.9% of sample respondents responded with answering (no), that is, they did not use feed additives. The results revealed that most of the participants did not prefer to use concentrated feed, likely due to several factors. Key among is the high prices of raw feed materials, which reduces the financial return from feeding livestock, as observation made by Lukuyu *et al.* (2011).

The results of overlay analysis distribution of the study participants according to period's, willingness and health problems are summarized in Table 8. According to the using periods of concentrate diet, it was clear that the majority of the study sample (16.7%) started using compound feed (more than 7 years ago), followed by 16.1% of the study sample (1-2 years) and then 8.4% of the sample started using compound feed since 3-4 years old. While 6.3% of the studied sample started using compound feed 5-7 years ago. This is consistent with what Rasyid *et al.* (2018) stated that livestock breeders often have limited knowledge of compound feeds, this lack of understanding is largely due to the failure to adopt modern technologies in livestock, including the use of compound feeds. The results also showed that there was 52.5% of the sample that didn't use a concentrate diet for feeding livestock. Regarding the attitudes and willingness of the study participants to use the concentrated diet. We found that the majority of the study sample members, representing 65.7% of the total study sample, responded with (yes) about the special statement being the desire to continue using a concentrated diet, while we found that 34.2% of the total study sample responded with (no), meaning that they did not want to continue using the concentrated diet for their animals. The farmers have concerns about the welfare aspect of their flocks when using the concentrated diet. However, the results indicate that the majority (62.9%) of the total study sample didn't notice health or other problems in their livestock by using the concentrate feed and 37.1% of the total study sample noticed health problems when using the concentrate diet. This is consistent with Blanco *et al.* (2015), who stated that compound feeds do not cause health problems when used in fattening lambs. The main health problem that farmers faced was the mixed health problems (50.6%) in the first place and other problems including abscesses (7.9%), diarrhea (4.3%), thinness (8.5%), hair loss (2.4%) and reproduction problems such as abortion (2.4%), followed by productivity problems such as changes in meat-color (13.4%) and low milk production (1.2%) as in Table 9. It agrees with what Alhidary *et al.* (2017) mentioned: feeding lambs on compound rations may cause the dark color of the rumen tissues. In contrast, Zhong *et al.* (2020) reported compound diets improved the quality of milk in the dairy cows by increasing the proportion of milk protein and decreasing the proportion of milk fat.

Table 9: Distribution of the study participants according to health problems variable.

Health problems*	Frequency	Percentage (%)
Meat color	22	13.4
Milk production	2	1.2
Diarrhea	7	4.3
Thinness	14	8.5
Hair pulling/loss	4	2.4
Reproductive(Abortion)	4	2.4
Abscesses	13	7.9
Mix	83	5.6
Didn't notice	11	6.7
No responses	4	2.4
Total	164	100

* More than one health problems.

CONCLUSION

This study provides a comprehensive overview of the demographic and occupational characteristics of livestock farmers in Saudi Arabia. A male dominated sector, 58.9% of participants are male. A relatively young workforce with almost 48.9% under the age of 37. Predominantly with secondary education (34.4%). Significant experience in livestock farming, with 41% having less than 12 years of experience. A significant proportion (75.2%) reported having a monthly income of less than SR 5000. Sheep rearing is the most common livestock rearing system (82.2%). The Badia system is the predominant herding system (59.5%), mainly concentrated in the Riyadh region (16.1%). A significant proportion of livestock is kept for commercial purposes (38%). Traditional feeding methods are predominant, with green alfalfa (34.6%), barley (87.1%) or a combination of both being the main feed sources. Low acceptance of concentrates (86.9%), although 43.3% are willing to use them. Concerns were expressed about potential health problems, such as changes in meat color. These results highlight the potential to improve production efficiency by introducing more balanced and optimized feeding strategies. This could include the use of well-formulated concentrates, improved feed quality and variety and the use of more efficient feeding techniques. Therefore, this study provides valuable insights into the current state of livestock production in Saudi Arabia and identifies key areas where nutrition, welfare and overall farm management can be improved.

ACKNOWLEDGEMENT

The authors thank the Ongoing Research Funding Program, (ORF-2025-1096), King Saud University, Riyadh, Saudi Arabia for funding this research.

Disclaimers

The authors are responsible for the accuracy and completeness of the information provided, but do not accept any liability for any direct or indirect losses resulting from the use of this content.

Informed consent

The study complied with the King Saudi Arabia standards on animal use (KSU-SE-21-758) and were approved by the local animal care and welfare committee of King Saud University.

Conflict of interest

The authors declare no conflict of interest.

REFERENCES

Abu Hatab, A., Cavinato, M.E., Lagerkvist, C.J. (2019). Urbanization, livestock systems and food security in developing countries: A systematic review of the literature. Food Sec. 11: 279-99. doi.org/10.1007/s12571-019-00906-1.

Ahamed, M.S., Sultan, M., Shamshiri, R.R., Rahman, M.M., Aleem, M., Balasundram, S.K. (2023). Present status and challenges of fodder production in controlled environments: A review. Smart Agric. Technol. 3: 100080. doi: 10.1016/j.atech. 2022.100080.

Alhidary, I.A., Abdelrahman, M.M., Aljumaah, R.S., Alyemni, A.H., Ayadi, M.A., Al-Saiady, M.Y. (2017). Rumen discoloration of growing lambs fed with diets containing different levels of neutral detergent fibre. Pakistan Journal of Zoology. 49(5): 1847-1855. doi.org/10.17582/journal.pjz/2017. 49.5.1847.1855.

Alhidary, I.A., Al-Baadani, H.H., Alharthi, A.S., Aboragah, A.A. (2024). The effects of varied neutral detergent fiber levels on blood parameters, nutrient digestibility, rumen fermentation charac-teristics and rumen tissue morphology in lambs. Indian Journal of Animal Research. 58(12): 2115-2124. doi: 10.18805/IJAR.BF-1860.

Al-Mutairi, M.H., Al-Zahrani, K.H., Qassem, H.S. (2023). Assessing the impact of compound feed on Livestock: Saudi Arabian Livestock breeders perspective. J. Livest. Sci. 15: 242-248. doi. 10.33259/JLivestSci.2024.242-248.

Alnafissa, M., Alotaibi, B.A., Aldawdahi, N., Imran Azeem, M., Muddassir, M. (2024). Optimizing animal care through compound feed management in Saudi Arabia. Frontiers in Sustainable Food Systems. 8: 1406715. doi.org/10.3389/fsufs. 2024.140 6715.

Blanco, C., Giráldez, F.J., Prieto, N., Benavides, J., Wattegedera, S., Morán, L., Bodas, R. (2015). Total mixed ration pellets for light fattening lambs: Effects on animal health. Animal 9: 258-266. doi.org/10.1017/S1751731114002249.

Codex Alimentarius Commission. (2004). Code of Practice on Good Animal Feeding CAC/RCP 54-004. CAC, Rome.

FAO (2023). Contribution of Terrestrial Animal Source Food to Healthy Diets for Improved Nutrition and Health Outcomes: An Evidence and Policy Overview on the State of Knowledge and Gaps. Rome: FAO.

Farkas, J., Mohácsi-Farkas, C. (2011). History and future of food irradiation. Trends Food Sci. Technol. 22: 121-126. doi. org/10.1016/j.tifs.2010.04.002.

GASTAT. (2020). General Authority for Statistics, Detailed results of the agricultural census. Kingdom Saudi Arabia. 68.

Henchion, M., Moloney, A.P., Hyland, J., Zimmermann, J., McCarthy, S. (2021). Trends for meat, milk and egg consumption for the next decades and the role played by livestock systems in the global production of proteins. Animal. 15: 100287. doi.org/10.1016/j.animal.2021.100287.

Henein, S., EL-Hawary, N., Hawary, H., Mohamed, F. (2021). Actual role of agricultural extension in the field of raising of sheep and goats. Fayoum Journal of Agricultural Research and Development. 35(2): 428-444. doi.org/10.21608/FJARD. 2021.198679.

Kasima, J. (2019). Comparative assessment of feed formulation among livestock farmers in Kakiri sub-county Wakiso district (Doctoral dissertation, Makerere University).

Linde, H., Oglethorpe, J., Sandwith, T., Snelson, D., Tessema, Y., Tiéga, A., Price, T. (2002). Beyond boundaries: transboundary natural resource management in sub-Saharan Africa. World Wildlife Fund. 166: 1-12.

Lukuyu, B., Franzel, S., Ongadi, P.M., Duncan, A.J. (2011). Livestock feed resources: Current production and management practices in central and northern rift valley provinces of Kenya. Livestock Research for Rural Development. 23(5): 112-129.

Makkar, H.P., Tran, G., Heuzé, V., Giger-Reverdin, S., Lessire, M., Lebas, F., Ankers, P. (2016). Seaweeds for livestock diets: A review. Anim. Feed Sci. Technol. 212: 1-7. doi.org/10. 1016/j. anifeedsci.2015.09.018.

Makkar, H.P.S. (2018). Feed demand landscape and implications of food-not feed strategy for food security and climate change. Animal. 12(8): 1744-1754. doi.org/10.1017/S1751 73111700324X.

MEWA, (2020). Ministry of environment, water and agriculture. Professional guide for livestock breeders - Livestock feeding, national plan to improve the productivity of the livestock sector, ministry of environment, Water and Agriculture. Riyadh, Kingdom of Saudi Arabia.

MEWA. (2021). Ministry of Environment, Water and Agriculture. Total numbers of animals according to the health card, unpublished data, Ministry of Environment, Water and Agriculture, Riyadh, Kingdom of Saudi Arabia.

Mohammed, A.A., Al-Suwaiegh, S., Al-Gherair, I., Al-Khamis, S., Al-Awaid, S., Al-Sornokh, H., Mohammed, A. (2024). Morphological characteristics of ovarian tissues and follicular fluid metabolites of female lambs and ewes in subtropics. Indian Journal of Animal Research. 58(5): 791-796. doi.10.18805/IJAR.BF-1756.

Muruz, H., Çelik, S., Genç, B. (2024). Effect of exogenous enzyme mixture on growth performance, digestibility and some rumen parameters of finishing lambs fed high whole grain hulled barley diet. Indian Journal of Animal Research. 58(3): 447-452. doi.10.18805/IJAR.BF-1482.

Rasyid, T.G., Amrullah, T., Kasim, S.N., Saleh, I.M., Rohani, S. (2018). Technology adoption of complete feed by cattle cow breeder. American Eurasian Journal of Sustainable Agriculture. 12(1): 1-4. doi.org/10.22587/aejsa.2018.12.1.1.

Robinson, T.P., Thornton, P.K., Francesconi, G.N., Kruska, R.L., Chiozza, F., Notenbaert, A.M.O., See, L. (2011). Global livestock production systems. FAO and ILRI. 24.

Salama, F.A., Mohamed, F.A., and Keneber, K.A. (2019). Unsafe practices in animals and poultry production in rural areas of menoufia governorate. Menoufia Journal of Agricultural Economic and Social Sciences. 4(2): 183-184. doi.org/10.21608/MJABES.2019.174609.

Subrahmanyeswari, B., Mahesh, C. (2008). Livestock Production Practices of Registered Organic Farmers in Uttarakhand State of India. In Cultivating the Future Based on Science. Proceedings of the Second Scientific Conference of ISOFAR.

Thornton, P.K. (2010). Livestock production: Recent trends, future prospects. Philosophical Transactions of the Royal Society B: Biol. Sci. 365: 2853-2867. doi.org/10.1098/rstb.2010.0134.

Tiseo, K., Huber, L., Gilbert, M., Robinson, T.P., Van Boeckel, T.P. (2020). Global trends in antimicrobial use in food animals from 2017 to 2030. Antibiotics. 9(12): 918. doi.org/10.3390/antibiotics9120918.

Yamane, T. (1967). Statistics, an Introductory Analysis, 2nd Ed., New York: Harper and Row.

Young, J.R., O'reilly, R.A., Ashley, K., Suon, S., Leoung, I.V., Windsor, P.A., Bush, R.D. (2014). Impacts on rural livelihoods in Cambodia following adoption of best practice health and husbandry interventions by smallholder cattle farmers. Transboundary and Emerging Diseases. 61: 11-24. doi.org/10.1111/tbed.12193.

Zhong, R., Zhao, C., Feng, P., Wang, Y., Zhao, X., Luo, D., Fang, Y. (2020). Effects of feeding ground versus pelleted total mixed ration on digestion, rumen function and milk production performance of dairy cows. International Journal of Dairy Technology. 73(1): 22-30. dx.doi.org/10.1111/1471-0307.12656.