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Management practices and occurrence of liver fluke (*Fasciola* spp.) on ruminant livestock in Tanudan, Kalinga

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ABSTRACT

Liver fluke is a common endoparasite that occurs in ruminants. The study aimed to determine the management practices and prevalence of liver fluke *(Fasciola* spp.) on ruminant livestock in Tanudan, Kalinga. The descriptive and percentage methods were employed in the study to ascertain the management practices and demographic profile. SPSS version 23 was used to analyze the data. There are 46% of the raisers who are between the ages of 51 and 60, are married, mostly at the elementary level, and work in farming with an estimated yearly income of 21,000 to 30,000. The majority of respondents owned one carabao and one cattle and had been keeping ruminants for one to five years, primarily for additional income. 74% of the raisers did not participate in training related to animal production. Some grazed in rice fields, mountains, and even riverbanks, while the ruminant livestock producers used a tethering system. Half of the farmers' housing is fair and good for their feeding practices, while the other half is rated as extremely poor for housing management. Occurrence of liver fluke (*Fasciola* spp.) is high, with ruminant livestock in Barangay Dupligan and Lower Taloctoc at 50 percent, while Barangay Pangol had 20 percent, Upper Taloctoc had 10 percent, and Mabaca had 0 percent. The presence of other endoparasites such as *Trichostrongylus* spp.*, Haemonchus* spp.*, Ostertagia* spp., *Eimeria* spp.*, Trichuris* spp.*, and Paramphistomatidae* spp. was evident. Very poor feeding practices were identified as the primary cause of occurrences of liver flukes based on correlation analysis.

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INTRODUCTION

The national fasciolosis control program in the country aimed to stop the rapid decrease of ruminant animals. This disease causes sickness, low ability to produce caracalf, and death in these types of animals (Gray *et al.*, 2008). Fasciolosis also poses a significant threat to the economy of countries with large livestock populations. Agricultural losses resulting from fasciolosis can be substantial due to decreased milk production and weight loss in affected animals. Strategic use of anthelmintics, pasture management (rotational grazing), use of biological control agents (fungi), snail control, and vaccination should be done to prevent and control fasciolosis (Jeyathilakan *et al.*, 2010).

In Kalinga, especially at the town of Tanudan, the treatment, prevention, and control of fasciolosis are not systematized, as most of the ruminant animals, especially carabao's which are the main draft animals in the locality, are suspected to have incidences of fasciolosis. Domingo (2014) said that the Philippine ruminant industry regards Fasciola infection as a major impediment to fully realizing the potential of carabao production. The economic impact of this parasite encompasses costly interventions, reduced output across all ruminant products, compromised reproductive capacity in animals, decreased draft power, and elevated mortality rates.

The primary objective of this study is to investigate the occurrence of liver fluke and the management and practices in the prevention and control of ruminant animals commonly raised by farmers in the five barangays of Tanudan, Kalinga. The results obtained from this research will serve as a crucial foundation for any future technical and extension projects or other initiatives that may be used by the local government units in Tanudan, Kalinga. Furthermore, these findings will also be beneficial to students and upcoming researchers who are researching similar topics, as they will provide an excellent review of the current state of knowledge and help to guide future studies. In summary, this study has far-reaching implications for both ruminant livestock farmers and researchers alike, and it is hoped that its findings will contribute significantly to our understanding of liver fluke in this region.

MATERIALS AND METHODS

Drafting of sample questionnaires

The survey questionnaire was prepared and used to collect relevant information from respondents. First, the survey questionnaire covered the demographic profile of the ruminant livestock raisers, which includes sex, gender, educational attainments, etc. Second, the survey questionnaire covers management practices like the type of housing, feeding practices, and health practices of the ruminant livestock raisers. Third, the survey questionnaire covers the problems encountered by the ruminant livestock raisers, like the percentage of mortality of their ruminant livestock animals.

Pretrial administration of the questionnaire

One week before the study, a pre-trial was conducted to assess the improvement of the draft questionnaires were administered to ruminant livestock raisers in Tabuk City, Kalinga. A structured survey questionnaire was designed to capture the information of the owner, animal, and management practices. The questions were made in English and translated into the local dialect during the face-to-face interview. The demographic profile of the Carabao raisers was obtained during the face-to-face interview. The gathered data were organized in Microsoft Excel.

Study design and sampling

The study was conducted from October 22 to 28, 2024. The study was coordinated directly with the Barangay Chairperson of the five Barangays, namely: Pangol, Mabaca, Dupligan, lower Taloctoc, and upper Taloctoc, by explaining the purpose of the study and its significance. Each barangay was sampled with ten (10) ruminant animal species, regardless of their sex. The ruminant animal species that were subjected to fecal collection should manifest signs of diarrhea, weight loss, poor growth, etc. However, if these signs are not encountered, a sample of animals will still be subjected to fecal collection. The study used descriptive and

percentage methods to determine whether the results show a high prevalence of Fasciola in five locations.

Fecal sample collection

Below is the procedure done during the fecal sample collection:

1. Before collection, surgical gloves, a collection cap, a cooler, alcohol, and ice were prepared.
2. The surgical glove is worn, and the animal is restrained. Make sure that your nails are cut before collection.
3. The index and middle fingers were gently inserted into the rectum of the animal, one finger at a time. The fingers are spread to allow air into the rectum.
4. At least 4 to 6 grams of feces were taken from the large animal's rectum.
5. The gloves were peeled from the hand, keeping the fecal sample encased within it.
6. The fecal samples were placed in a small plastic cap and placed in a cooler with ice to keep the samples cool.
7. Upon returning to Tabuk, the samples were transferred to the refrigerator until submission at the Cagayan Valley Integrated Agricultural Laboratory.
8. The fecal sample containers were labelled with code P1 to P10, M1 to M10, D1 to D10, T1 to T20; these letters represent the names of the barangays where the collection was done, and the numbers represent the number of animals.

Study procedure and analysis

The fecal samples were transported to the Cagayan Valley Integrated Agricultural (CVIAL-DA RF02) Laboratory for fecal analysis. The data and information gathered were tabulated, summarized, and analyzed using descriptive statistical tools such as frequency counts, percentages, mean, and weighted mean. Correlation analysis was employed to identify the relationship of management practices to the occurrence of *Fasciola* in Carabao.

Data management and analysis

The collected data were encoded in Microsoft Excel and analyzed using SPSS Version 23. Prevalence and parasite identification data were calculated using the formula below, corresponding to the data collected:

Parasite ova identification: The parasite ova were identified based on morphology and physical appearance up to the genus level.

PRF%={(Number of positive sample of Fasciola)/Total number of sample}×100

Prevalence rate of other intestinal parasites: The prevalence of other intestinal parasites was obtained using the formula.

PIRP(Roundworm)= {(Number of positive sample with roundworm)/Total number of sample}×100

PIRP (Coccidia)= {(Number of positive sample with Coccidia)/Total number of sample}×100

RESULTS AND DISCUSSION

Demographic profile of the livestock raisers

Table 1 shows the demographic profile of the livestock raisers in the five barangays of Tanudan, namely: Dupligan, Lower Taloctoc, Mabaca, Pangol, and Upper Taloctoc, who are male, comprising 96 percent of the 50 respondents. The data showed that male dominates livestock farming endeavors. While the female respondent shows only 4 percent of those mentioned barangays. The finding reveals that males are more engaged in ruminant livestock farming compared to women in Tanudan, Kalinga.

With regards to the age of livestock raisers in five barangays of Tanudan, Kalinga, 12 percent of livestock raisers were in the 18-40 age group, 36 percent in the 41-50 age group, 46 percent in the 51-60 age group, and 6 percent were in the above 60 age group. This result showed that a large portion of livestock raisers are in the age group of 51-60 years old. Further results explained that a significant portion of livestock raisers have extensive experience in raising livestock. The results are similar to those of the study by Sharma (2016), which found that young people are not interested in performing various agricultural-related activities, while the elders are still

taking care of the animals. A study conducted by Birol *et al.* (2024) stated that the rapid aging problem in the villages is getting more and more attention, and raises concerns for the sustainability of agriculture. This may be due to the migration from the village to the city, and population pressure in the cities makes urban life difficult.

Table 1. Demographic profile of the respondents as to their gender, age, civil status, and educational attainment

Profile		Frequency	Percentage (%)
Gender	Female	2	4.0
	Male	48	96.0
Age	18-40	12	12.0
	41-50	18	36.0
	51-60	23	46.0
	Above 60	3	6.0
Civil status	Married	46	92.0
	Single	1	2.0
	Widowed	3	6.0
Educational attainment	College graduate	7	14.0
	College level	8	16.0
	Highschool graduate	7	14.0
	Highschool level	9	18.0
	Elementary graduate	5	10.0
	Elementary level	12	24.0
	No formal education	2	4.0
In-charged in in raising ruminant livestock	All family	3	6.0
	Father	46	92.0
	Mother	1	2.0
Source of Income	Farming	50	100

In addition, young farmers who continue agriculture have a lack of knowledge about entrepreneurship, adaptation to new techniques and technologies, business planning, marketing, risk management, organization, and environmentalist agricultural approaches in terms of the sustainability of agriculture.

The study of Giwu *et al.* (2025) mentioned that most male youth who engage in agriculture have secondary education. However, perceptions and aspirations did not significantly influence their decision to participate in agriculture. Most of the youth who participated in agriculture are in smallholder farming and other agricultural activities, but they view this sector poorly. Also, the reasons why young individuals do not pursue agriculture are due to a lack of exposure to farming, because limited exposure to farming practices and opportunities may discourage young people from pursuing livestock farming.

Table 1 reveals that most respondents were married, comprising 92 percent of the total sample. This finding suggests that marriage is a dominant factor among livestock raisers. The high percentage of married respondents may indicate a societal trend towards the traditional institution of marriage as a preferred form of partnership or union. It also implies a strong cultural emphasis on the value of long-term committed relationships within the community. This statistic underscores the importance of considering marital perspectives and dynamics when addressing social issues and implementing policies that impact families and households.

Additionally, the data shows that 3 percent of the respondents were identified as widows, while 1 percent was single.

The educational attainment of the livestock raisers shows a low level of formal education, with 24 percent of the livestock raisers having finished their elementary education, while 10 percent of the livestock raisers are elementary graduates. Livestock raisers on the secondary level represent an 18 percent distribution for dropouts and 14 percent for high school graduates. The same trend is observed in the tertiary level, where 16 percent are dropouts and 14 percent of them have college degrees. These results suggest several potential underlying factors that prevent livestock raisers from gaining more knowledge relative to production management. Among the respondents, 4 percent have no formal education, indicating that the majority attained at least a primary to secondary level.

In the study conducted by Eric *et al.* (2014), they stated that educational level increases the knowledge of farmers, which results in increasing

agricultural production. Education is important to the improvement of agricultural productivity, such that formal education opens the mind of the farmer to knowledge. However, they also stated that farmers with no formal education can be given attention by providing them with hands-on training and better methods of farming. In addition, the educational profile could potentially limit the opportunities available to livestock raisers, as higher education is often correlated with better production management.

The results of the survey showed that the father is most engaged in raising livestock, with 92 percent of the respondents. Revealing a dominant role of fathers as the caretakers of their livestock animals in the rural areas, where most of the activities about livestock production are done by men. Only 2 percent of the respondents are mothers, while 6 percent said that the whole family is involved in raising livestock. The results showed a lower participation of women in livestock farming. As a mother has fewer chances for training and seminars. In this study, the mother's participation is minimal because of possible gender bias, lack of seminars and training, and observation tours. The possible reasons why many people do not participate in livestock farming activities are that mothers are more responsible in caring for their children, and other activities such as cooking for the family, and many more. Women's involvement is higher in the case of non-cashable farm activities, such as forage collection, cleaning, and feeding of animals, whereas men's approach is more on attractive jobs related to cashable activities, such as milking of animals and selling of milk (Paudel *et al.*, 2009).

The majority of the respondents rely on farming as their major source of livelihood in Tanudan, Kalinga. This data shows the importance of agriculture in the daily life of people, not only in the province. An essential part of the Philippine agricultural sector is the cattle industry. Its importance to the nation's economy is demonstrated by the fact that it supports a large number of rural residents and accounts for approximately 18.23 percent of agriculture's gross production value (Ortega *et al.*, 2021).

Demographic profile of the number of livestock owned

Table 2 presents the demographic profile of the respondents as to their number of ruminant livestock they own. The results revealed that most livestock raisers are raising one carabao only, with 38% of the respondents, and the majority of them utilize carabaos for farming activities such as land preparation and hauling, while 22 percent of the respondents raised only one cattle for additional income. 6 percent of the respondents said that they only raised two carabao and two cattle, and 6 percent for only raising 2 Cattle, 4 percent raised only 1 Carabao and 1 Cattle, and percent of the respondents raised 3 Cattle raising. The rest of the respondents with 2 percent distribution are of the respondents raised 1 Cattle and 2 Carabao, percent of the respondents raising 2 Carabao only, 2 percent of the respondents raising 4 Cattle, 2 percent of the respondents raising 5 Cattle, 2 percent of the respondents raised 6 Carabao, 2 percent of the respondents raising 6 Cattle, and 2 percent of the respondents raising 7 Cattle.

Table 2. Number of livestock owned by a farmer

Profile	Quantity	Frequency	Percentage (%)
1 Carabao	19	38.0	38.0
1 Cattle	11	22.0	22.0
2 Carabao & 2 Cattle	3	6.0	6.0
2 Cattle	3	6.0	6.0
3 Cattle	2	4.0	4.0
1 Carabao & Cattle	2	4.0	4.0
4 Carabao	2	4.0	4.0
1 Cattle & 2 Carabao	1	2.0	2.0
2 Carabao	1	2.0	2.0
4 Cattle	1	2.0	2.0
5 Cattle	1	2.0	2.0
6 Carabao	1	2.0	2.0
6 Cattle	1	2.0	2.0
7 Cattle	1	2.0	2.0
3 Goats	1	2.0	2.0

Based on the results of the study, most of the respondents are raising cattle, which accounted for 32 Cattle, followed by 18 Carabao, and 3 Goats from the

50 respondents across the five barangays of Tanudan, Kalinga. The Livestock raisers in Barangay Pangol chiefly raised cattle as additional income, while the remaining for the Barangay are raising carabao, which are mainly used for crop farming activities. It is observed that an individual livestock raiser is raising a minimum of one Carabao and one Cattle, and the number of their livestock animals is dependent on the financial capacity of the farmer to purchase.

Table 3. Reasons of raising ruminant livestock, number of years raising ruminant livestock, estimated annual income from ruminant livestock

Profile	Frequency	Percentage (%)
Reasons of raising livestock		
As main income	7	14.0
For Additional Income	43	86.0
Numbers of years raising livestock		
1 to 5	31	62.0
11 to 15	10	20.0
16 to 20	6	12.0
6 to 10	3	6.0
Estimated annual income		
10,000-20,000	11	22.0
21,000-30,000	12	24.0
31,000-40,000	11	22.0
41,000-50,000	12	24.0
51,000 above	3	6.0
None	1	2.0

Table 3 shows the reasons for raising livestock, the number of years of raising, and the estimated annual income of the livestock raiser. A total of 43 respondents were interviewed, and 86 percent of them said that raising livestock was chiefly for additional income. While 14 percent of respondents mentioned that raising livestock animals is their major income. This result showed that the majority of the livestock raisers purposefully raised the animals as an additional source of livelihood. With this perspective, production management is sometimes affected by the interest of the raiser to pursue production. For the number of years of their engagement in livestock rising, 62 percent are engaged for 1 to 5 years, 20 percent for 11 to 15 years, 16 percent for 16 to 20 years, and 6 percent for 6 to 10. The respondents were interviewed in five Barangays of Tanudan, Kalinga, about their annual income for raising livestock animals, and 24 percent of the respondents have an income of 21,000 to 30,000. 24% of respondents have an income of 41,000 to 50,000, 22% of the respondents have an income of 10,000 to 20,000, 22% of the respondents have an annual income of 31,000 to 40,000, 6% of the respondents have an annual income of 51,000 above, and 2% of the respondents that there were no income gained in raising livestock.

Table 4. Trainings attended, training provider, and ruminant livestock ownership

Particulars	Frequency	Percent (%)	Valid percentage (%)
Training attended			
No	37	74.0	74.0
Yes	13	26.0	26.0
Training provider			
Department of agriculture	1	2.0	2.0
Provincial/Local	2	4.0	4.0
Kalinga state university	10	20.0	20.0
Livestock ownership			
Share basis	11	22.0	22.0
Sole owner	39	78.0	78.0

Table 4 presents the training attended, the training provider, and ownership of the livestock animal in five Barangays of Tanudan, Kalinga. The fifty respondents were interviewed, and the results showed that 74 percent of the respondents answered no, while 26 percent of the respondents answered yes. Results illustrate that the majority of the livestock raisers did not attend training related to livestock management. This means that livestock raisers in five Barangays in Tanudan needed more attention in providing training to improve their livestock production management.

Amongst the 50 respondents related provided trainings regarding livestock,26 percent of the respondents attended training, where 10 percent of the respondents said that the Kalinga State University was the major provider of the training, 4 percent of the respondents mentioned the provincial and local, and 2 percent of the livestock respondents that the Department of Agriculture provides them with the training on livestock. The results showed that Kalinga State University is more active in extending training to livestock raisers in Tanudan, Kalinga, while the

Government and the Department of Agriculture showed less participation in engaging with the livestock raisers.

On the livestock ownership of the respondents, results showed that 78 percent of the respondents are the sole owners of their livestock animals, while 22 percent of the respondents are on a share basis, which means that they might be a tenant, as they do not own the livestock animals they raised.

Prevalence of liver fluke in five barangays of Tanudan, Kalinga

Table 5 shows the occurrence of Liver Fluke in five barangays of Tanudan, Kalinga. The results were obtained from fecal analysis sedimentation technique from the Animal Disease Diagnostic Laboratory, Regional Field Office, Tuguegarao City. The results revealed that Barangay Dupligan and Lower Taloctoc are positive for liver fluke infestation at a 50 percent prevalence.

Table 5. Prevalence of liver fluke per barangay as to fecal analysis results

Barangay	Occurrence of liver fluke		Total
	Negative (-)	Positive (+)	
Dupligan	5	5	10
Lower Taloctoc	5	5	10
Mabaca	10	0	10
Pangol	8	2	10
Upper Taloctoc	9	1	10
Total	37	13	50

In Barangay Pangol, out of 10 ruminant livestock, two ruminant animals are positive for *Fasciola* spp., while 1 ruminant animal is positive in Upper Taloctoc. For Barangay Mabaca, there are no livestock animals that are positive for Fasciola spp. But other presence of other internal parasites like *Ostertagia* spp*, Trichostrongylus* spp., and *Haemonchus* spp. were present. The total of positive livestock animals tested was thirteen from the fifty livestock in five barangays of Tanudan, Kalinga. The occurrence of liver flukes in the above-mentioned barangays, such as Barangay Dupligan and Lower Taloctoc, is caused by feeding their large ruminants in pasture areas and rice fields, and even river banks. Kaplan (2001) stated that very poor feeding practices, such as grazing on contaminated pastures, can increase exposure to liver fluke metacercariae. He also stated that the occurrence of liver flukes is mainly due to the presence of their intermediate host, the mud snail.

The life cycle of liver flukes necessitates an intermediate host, typically mud snails such as *Galba truncatula or Lymnaea truncatula*, which inhabit wet, poorly draining pastures. The risk of liver fluke infestations increases with consistently warm and wet weather, as such conditions enhance the snails' habitat and promote the development of fluke eggs and the intermediate stages of their life cycle within the snail.

Correlation analysis

Correlation analysis results of housing management practices in the occurrence of *Fasciola* spp. are presented in Table 6. The results showed that housing management practices of livestock raisers in five barangays of Tanudan, Kalinga are very poor, wherein thirteen livestock animals are positive with *Fasciola* spp., while thirty-seven livestock animals are negative with *Fasciola* spp. Correlation analysis results showed that no statistics were computed between housing and the occurrence of *Fasciola* spp. because housing has a constant value. All respondents have very poor management practices regarding housing.

Table 6. Correlation analysis results of housing management practices in the occurrence of liver fluke in ruminant livestock

Variable	Description	Occurrence of liver fluke		Total
		Negative (-)	Positive (+)	
Housing	Very poor	37	13	50
Total		37	13	50

According to the results of the correlation, it revealed that there is no correlation between poor housing management on the occurrence of liver flukes in large ruminants. These results are supported by Kaplan (2001), who stated that liver fluke infection is mainly associated with grazing animals on contaminated pastures, rather than housing. The housing management may not have a direct impact on liver

fluke presence. This means that poor housing management might not directly contribute to liver fluke infestation, as the parasite's life cycle involves snails and grazing areas. Murphy and Bremner (2002) also mentioned that other factors such as factors, such as climate, pasture management, and snail populations, might have a stronger influence on liver fluke presence, masking any potential effects of housing management.

Table 7. Correlation analysis results of feeding management practices in the occurrence of liver fluke in ruminant livestock

Variable	Description	Occurrence of liver fluke		Total
		Negative (-)	Positive (+)	
Feeding	Fair	22	3	25
	Good	15	10	25
Total		37	13	50

Table 7 presents the correlation analysis of feeding management practices in the occurrence of Liver Fluke in ruminant livestock. The results showed that under fair feeding practices, there were twenty-two negative livestock animals to Liver Fluke, while 3 animals were positive to Liver Fluke. On the good assessment practices, fifteen animals were negative with Liver Fluke, while ten animals were positive with Liver Fluke. The correlation results showed that there is a very strong positive relationship between feeding management practices and the occurrence of Liver Fluke (φc= 0.319, *p*-value = 0.024). The correlation is significant at the 0.05 level (2-tailed). The results further explained that, even though feeding practices are good, the occurrence of Liver Fluke is high. Mostly, grazing and feeding of fresh grass such as Carabao grass, as well as organic farming, were significantly associated with rumen and liver fluke occurrence (Forstmaier *et al.*, 2021).

The livestock raisers in five barangays in Tanudan chiefly fed their livestock with fresh grasses and allowed them to graze along river banks, rice fields, and mountainous areas. Due to limited pasture areas, livestock raisers have no choice but to feed their livestock anywhere in their barangay. Poor feeding practices can lead to the susceptibility of large ruminant animals to liver fluke infestations. According to the study of Sargison and Scott (2011), they stated that poor feeding management can lead to nutritional deficiencies, which result in weakening of the immune system and increasing susceptibility of the animal to liver fluke infestation. Inadequate feeding practices, such as grazing on contaminated pastures, can increase exposure to liver fluke metacercariae (Kaplan, 2001). The findings of Kaplan (2001) are similar to my observation that the majority of the large ruminant raisers feed their animals on the river banks, rice fields, and anywhere where feed is available. In this practice, the exposure of animals to liver fluke is higher since there is no assurance that the feed resources are safe from liver fluke contamination. Moreover, poor nutrition as a result of very poor feeding can impair liver function, which makes the ruminants vulnerable to liver fluke damage.

The correlation analysis results of healthcare management practices in the occurrence of Liver Fluke in livestock are presented in Table 8. The results showed that assessment of fair healthcare revealed eleven livestock negative for Liver Flukes, while three livestock were positive. In good healthcare, there were 23 negative for Liver Flukes, while nine livestock were positive. Under very good healthcare, three livestock are negative and one is positive for Liver Flukes. The correlation explained that there is a weak relationship between healthcare management practices and the occurrence of Liver Fluke (φc = 0.068, *p*-value = 0.892).

According to the results of the analysis, there is a weak correlation between healthcare management in the presence of liver fluke. This result is supported by the study of Sargison and Scot (2011), that there is a possibility that a limited focus on parasite control in health management practices might not prioritize parasite control, leading to a weak correlation with liver fluke presence. Kaplan (2001) also mentioned that ineffective or inconsistent treatment approaches might not adequately address liver fluke infestations, contributing to the weak relationship. Environmental factors, such as climate, pasture management, and

snail populations, might play a more significant role in liver fluke presence than healthcare management practices.

Table 8. Correlation analysis results of healthcare management practices in the occurrence of liver fluke in ruminant livestock

Variable	Description	Occurrence of liver fluke		Total
		Negative (-)	Positive (+)	
Healthcare	Fair	11	3	14
	Good	23	9	32
	Very good	3	1	4
Total		37	13	50

In addition, the differences in healthcare management practices among raisers might lead to inconsistent results, which lead to weak correlation (Thrusfield, 2018).

Management practices of ruminant livestock

Table 9 presents the management practices of the livestock raisers in the five barangays of Tanudan, Kalinga. The researcher assessed their management practices by actual observation of their farm, and the assessment revealed that the housing management of 100 percent poor. This result showed that the majority of the livestock raisers do not provide housing to their livestock animals, and the possible reasons why there is no housing for their animals might be financial or it is their traditional practices in raising ruminant livestock. It was observed that all livestock animals were tethered under the trees, in the field, and pasture areas. Very poor housing can also result in stress and behavioral problems in animals such as pacing, aggression, and reduced social interaction (Hemsworth *et al.*, 2015). Moreover, according to Gulliksen *et al.* (2009), he mentioned that poor housing conditions, such as inadequate shelter and ventilation, can increase mortality rates in ruminants.

The raiser's feeding practices were also assessed based on actual observations and interviews with the owner. The results showed that 50 percent of their practices are fair, while 50 percent are good, which means that their practices are still below the average of the feeding standards.

Table 9. Management practices of ruminant livestock as to housing, feeding, and healthcare

Variable	Description	Frequency	Percentage (%)
Housing	Very poor	50	100.0
	Fair	0	0.0
	Good	0	0.0
	Very good	0	0.0
Feeding	Very poor	0	0.0
	Fair	25	50.0
	Good	25	50.0
	Very good	0	0.0
Healthcare	Very poor	0	0.0
	Fair	14	28.0
	Good	32	64.0
	Very good	4	8.0

Most of the livestock raisers' feeding practices involve tethering and ranging in the mountains, rice fields, and even alongside river banks. Poor feeding management can have significant effects on large ruminants, including nutrient imbalance, reduced productivity, health issues, and impact on rumen function. To mitigate these effects, it is essential to provide balanced supplements, optimize feed intake of the animal, and monitor animal performance and adjust feeding strategies as needed to ensure optimal productivity and health of the animal (Xiao *et al.*, 2024).

On the health management of the livestock raiser to their livestock animals, the results revealed that 64 percent of the respondents were assessed as having good management for their health practices, 28 percent of the respondents have assessed as fair management for their practices, and 8 percent were assessed as very good in their health management practices. However, most of their health practices refer to deworming livestock to control internal and external parasites only.

Good health management practices in large ruminants such as cattle and carabao can have several positive effects by implementing effective health management practices, such as vaccination programs and parasite control, that can reduce the incidence of diseases and parasites (Thrusfield, 2018). Also, by reducing disease incidence and improving productivity, good health management practices can lead to increased profitability for farmers (Rushton,

2017). Moreover, good health management practices prioritize animal welfare, which is reducing animal suffering and improving the overall well-being of the animal itself (Hemsworth *et al.*, 2015).

Occurrence of other internal parasites

Table 10 presents the occurrence of other endoparasites among livestock in five barangays of Tanudan, Kalinga. The data was based on the results of the submitted samples report of the Regional Animal Disease Diagnostic Laboratory of the Cagayan Valley Integrated Agricultural Laboratory. The 50 obtained samples of fecal samples obtained were submitted for analysis. The results showed that ruminant livestock in Pangol, Tanudan obtained an 80 percent positivity rate of nematodes. The same results are obtained in Mabaca, Tanudan, where an 80 percent positivity rate of nematodes is obtained. The third barangay with a high positivity rate of nematode in Lower Taloctoc, accounting for 50 percent of ruminants who are positive for nematode, while 30 percent is obtained in Upper Taloctoc, Tanudan. The lowest positive rate of nematode is observed in Dupligan, Tanudan, which is only a 10 percent positivity rate.

Table 10. Prevalence of other internal parasites in five barangays of Tanudan, Kalinga

Barangay	Parasites (%)			
	Nematode	Roundworms	Coccidia	Rumen fluke
Dupligan	10	10	-	-
Lower Taloctoc	50	-	80	20
Mabaca	80	-	-	10
Pangol	80	-	-	-
Upper Taloctoc	30	-	40	-

The nematodes identified in the analysis report are *Trichostrongylus* spp., *Haemonchus* spp., and *Ostertagia* spp. According to David *et al.* (2009) describe *Trichostrongylus* spp. is the major economically important genus of parasites in small ruminants, and few are normally shared with cattle. Other nematodes present in the test ruminants are the *Haemonchus* spp., and *Ostertagia* spp. *The Haemonchus* spp. Grazing ruminants are constantly at risk of contracting nematode infections, which might seriously endanger animal welfare and limit agricultural output if left untreated. Anthelmintics and grazing management, where practical, are the main methods used to control (David *et al.*, 2003).

The presence of other parasites, like the coccidia, was also identified in the analysis report. The results showed that the highest percentage of coccidia, which is the *Eimeria* spp. accounted for 80 percent of the ruminant animals in Lower Taloctoc, Tanudan, are positive with *Eimeria* spp., while 40 percent of *Eimeria* spp. are identified in ruminant animals from Lower Taloctoc, Tanudan. The ruminant animals tested in Barangay Dupligan, Mabaca, and Pangol are negative for coccidia. The high occurrence of *Eimeria* spp. in two barangays of Taloctoc reflects possible contamination of the pasture area.

The ruminant animals tested in Lower Taloctoc showed that 20 percent of the ruminant animals are positive for rumen flukes based on the results of the analysis. This means that among the ten ruminant animals tested, two of them are positive for rumen fluke, while eight are negative for this parasite. Only 10 percent of the animal ruminants in Barangay Mabaca are positive for rumen flukes. This means that among the ten ruminant animals tested, only one ruminant animal tested positive, and nine were negative. Moreover, other barangays of Tanudan, such as Dupligan, Pangol, and Upper Taloctoc, revealed negative results of rumen flukes.

Grazing ruminants are continuously exposed to nematode infection, which, if uncontrolled, would restrict animal production and be a serious threat to animal welfare. Control is largely achieved using anthelmintics combined with grazing management, where the latter is a feasible option (David *et al.*, 2003).

CONCLUSION

The demographic profile of ruminant raisers in Tanudan reveals a concerning trend: an aging population dominated by men, with limited education, which may hinder the future growth and development of animal

production in the area. To ensure sustainability and increased productivity, it's crucial to attract younger, educated individuals and provide training and support to existing raisers, enabling them to optimize their ruminant management practices and tap into the potential of large ruminant animal raising as a significant income source. The study reveals a significant presence of liver fluke (*Fasciola* spp.) infestation in ruminants in five barangays of Tanudan, Kalinga, with an overall prevalence. The findings also highlight the presence of other internal parasites, emphasizing the need for targeted interventions and parasite control measures to mitigate the impact on animal health and productivity in the area. The study concluded that the cause of liver fluke occurrence is due to poor management practices of animal raisers, indicating that better feeding practices surprisingly correlate with higher liver fluke incidence. This suggests that factors beyond feeding management, such as grazing practices management, may play a crucial role in liver fluke infestation.

RECOMMENDATION

The ruminant raisers can adopt a rotating pastures strategy that can help reduce the risk of liver fluke infection by avoiding areas with high snail. Implement regular deworming programs, especially during high-risk periods. The Local Government of Tanudan, in collaboration with SUCs, should conduct training on ruminant management production, especially in those barangays with a high occurrence of liver fluke.

REFERENCES

Anderson DE, Rings M. 2008. Current veterinary therapy: Food animal practice. Elsevier Health Sciences.

Birol DC, Cobanoğlu F, Akdemir HA, Yılmaz Hİ. 2024. Impact of young farmer support program for livestock enterprises. Selcuk Journal of Agriculture and Food Sciences **38**(2), 243-264.

Copeman DB, Copland RS, Gray GD (eds.). 2008. Overcoming liver fluke as a constraint to ruminant production in South-East Asia. Australian Centre for International Agricultural Research.

Domingo CY. 2014. Epidemiology of fasciolosis in Nueva Ecija Province, Northern Philippines, including an assessment of ecological factors and recommended control measures. In: EAHMI Conference 2013, p. 138.

Eric O, Prince A, Elfreda A. 2014. Effects of education on the agricultural productivity of farmers in the Offinso Municipality. International Journal of Development Research **4**(9), 1951-1960.

Forstmaier T, Knubben-Schweizer G, Strube C, Zablotski Y, Wenzel C. 2021. Rumen (*Calicophoron/Paramphistomum* spp.) and liver flukes (Fasciola hepatica) in cattle—Prevalence, distribution, and impact of management factors in Germany. Animals **11**(9), 2727.

Giwu O, Ntlanga S, Bontsa V, Mdiya L, Gwala L, Makamane A, Mdoda L. 2025. Youth aspirations and participation in agricultural enterprise: A case study in Umzimvubu Local Municipality, Eastern Cape Province. Cogent Food & Agriculture **11**(1), 2488110.

Gray GD, Copland RS, Copeman DB. 2008. Overcoming liver fluke as a constraint to ruminant production in South-East Asia. ACIAR Monograph Series. Australian Centre for International Agricultural Research, Canberra, ACT, pp. 55-68.

Gulliksen SM, Lie KI, Løken T, Osterås O. 2009. Calf mortality in Norwegian dairy herds. Journal of Dairy Science **92**(6), 2782-2795.

Hemsworth PH, Mellor DJ, Cronin GM, Tilbrook AJ. 2015. Scientific assessment of animal welfare. New Zealand Veterinary Journal **63**(1), 24-30.

Jeyathilakan N, Mural K, Anandaraj A, Basith SA. 2010. In vitro evaluation of anthelmintic property of herbal plants against *Fasciola gigantica*. Indian Journal of Animal Sciences **80**(11).

Kaplan RM. 2001. Fasciola hepatica: A review of the economic impact in cattle and considerations for control. Veterinary Therapeutics **2**(1), 40-50.

Ortega ADSV, Mujitaba MA, Xayalath S, Gutierrez W, Soriano AC, Szabó C. 2021. Perspectives of the livestock sector in the Philippines: A review.

Paudel LN, Ter Meulen U, Wollny C, Dahal H, Gauly M. 2009. Gender aspects in livestock farming: Pertinent issues for sustainable livestock development in Nepal.

Rushton J (Ed.). 2009. The economics of animal health and production. CABI.

Sharma M. 2016. Effect of age and educational level of dairy farmers on knowledge and adoption of dairy farming practices in Kapurthala district of Punjab. International Journal of Farm Sciences **6**(4), 254-262.

Thrusfield M. 2018. Veterinary epidemiology. 4th edition. Comprehensive introduction to the role of epidemiology in veterinary medicine **8**, 168-187.

Xiao D, Meng T. 2024. Nutritional value evaluation and processing technology of feed and nutrition regulation measures for ruminants. Animals **14**(21), 3153. https://doi.org/10.3390/ani14213153