DIETS OF THE PHILIPPINE INDIGENOUS SHEEP : ITS COMPARISON TO INDIGENOUS GOATS DIETS AND INFLUENCE OF SAMPLING METHODS

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Summary

This study was conducted 1) to compare the nutrient content and mineral composition of the Philippine indigenous sheep and goats diets when grazed in common pasture during rainy season, 2) to determine the influence of sampling methods on nutrient content and mineral composition of upland (UP) and lowland (LP) native pastures, and 3) to compare these two pasture types in terms of nutrient and mineral composition. Experiment 1 used six esophageally fistulated animals, three each for sheep and goats. Weekly extrusa collection was done for a period of three months. Experiment 2 was conducted in UP and LP; these were sampled thrice by three methods, plucking, clipping and use of three esophageally fistulated sheep. Results of Experiment 1 indicated that the diets of sheep were greater in crude protein (CP; $p < 0.01$) and ether extract (EE; $p < 0.05$) but lower in crude fiber (CF) and acid detergent lignin (ADL; $p < 0.05$) than that of goat diets. All other nutrient fractions including mineral composition were not significantly different from each other. Significant findings of Experiment 2 were: CP content of UP was in the order fistulated > plucked > clipped ($p < 0.05$); CP content of LP was greater ($p < 0.05$) in fistulated and plucked samples; and ash content was greater ($p < 0.05$) in fistulated samples of both pastures. The CF of UP was different ($p < 0.05$) from each sampling method but the CF of LP and ADL of both pastures were greater ($p < 0.05$) in clipped samples. Most minerals either macro or microminerals were greater in fistulated samples of both pastures. Pooled data of the two pastures showed that LP had better nutrient characteristics and greater mineral composition. Based from this study, there were few differences between the diets of indigenous sheep and goats when grazed in common pasture. Also, sampling methods influenced the nutrient composition of indigenous sheep diets.

(**Key Words** : Philippine Indigenous Sheep, Philippine Indigenous Goat, Sampling Method, Nutrient Characteristic, Mineral Composition)

Introduction

In the Philippines, livestock raising is predominantly integrated into various farming systems. Swamp buffalo (carabao), cattle and goats are commonly seen in the farms. Sheep which comprise only a little portion of the total ruminant population in the country are increasing their numbers, including those at rice-based farming systems. Sheep is traditionally raised like goats. Whenever these two animals are reared together, they shared the same housing facility and grazed in a common pasture. Presently, there are some technological gap in promoting these two animals in the Philippines especially of the sheep (Faylon, 1989).

Describing the nutrient characteristics of the diets of grazing sheep and goats need to be accurate thus the prerequisite is to get the proper samples. Collecting the representative sample is complicated by the ability of grazing animals to select plants and plant parts. Three methods commonly used to collect forage samples are plucking, clipping and animal collector with esophageal fistula. Each method has its own advantages and disadvantages as described by Ishizaki et al. (1981) and Holechek et al. (1982).

Our objectives in this study were: 1) to compare the

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nutrient characteristic of the diets of indigenous sheep and goats when grazed in common pasture during rainy season, 2) to determine the influence of collection methods on nutrient and mineral composition of UP and LP native pastures, and 3) to compare the nutrient characteristic of these two pasture types.

Materials and Methods

Experiment 1

The study area was located at the small ruminant farm of the Department of Animal Science, Central Luzon State University, Munoz, Nueva Ecija, Philippines (altitude of 76 m at 15° 43′ N, 120° 54′ E). The average temperature [$(t_{max} + t_{min})/2$] was 27.3℃, mean maximum 32.3℃ and mean minimum 22.4℃. The average relative humidity was 73.4%.

Three esophageally fistulated indigenous sheep (average body weight of 24.5 kg) and three esophageally fistulated indigenous goats (average body weight of 20.8 kg) were used in this study. The animals were managed together and grazed in common pasture of improved and native grasses, however, stargrass (*Cynodon plectostachyum* Pilger) was the dominant species.

Weekly extrusa collection was done during rainy season (May, June and July) of 1991. Before the extrusa collection, the animals were fasted for 12 hrs prior to sampling. The time of sampling was scheduled before 1,000 and after 1,600. The extrusa samples were collected during a period of 30 min. All the animals were allowed to graze in a common pasture and extrusa collection was done on the same time. During the extrusa collection, the animals were fitted with screened plastic bags. The different extrusa samples were air dried and ground to pass in a 2-mm screen in a Wily mill and stored in plastic containers for later analyses.

Experiment 2

A private sheep farm located at Laur, Nueva Ecija, Philippines was the site of this experiment. The flock (n of ewes, 200) grazed in UP, a hilly native grassland predominantly *Themeda triandra* Forsk. with some patches of *Imperata cylindrica* (L.) Beauv. and LP, a rice paddies (between rice harvest and land preparation) with native grasses predominantly *Axonopus compressus* (Swartz.) Beauv. As a part of farmer's management, the flock was allowed to graze the UP and LP alternately. These two pasture types were studied by determining their nutrient characteristics as influenced by sampling methods. The three sampling methods (thrice replication) were: Ⅰ-plucking, simulating the grazing animals as closely as possible; Ⅱ-clipping, sampling at random with an area enclosed within one meter quadrat as close as possible to ground level and at a uniform height; and Ⅲ-using three esophageally fistulated indigenous sheep. Sampling was done in the month of August 1991 (within rainy season).

During the conduct of this experiment, the management of esophageally fistulated sheep was the same as in Experiment 1 in collecting an extrusa samples. Sampling of pasture using the different methods was done simultaneously. The samples collected were dried, ground and stored following the procedures mentioned earlier.

Laboratory analyses

The different samples collected were analyzed for dry matter (DM), ash, EE and CP by standard procedures (AOAC, 1984). Neutral detergent fiber (NDF) and acid detergent fiber (ADF) were assessed by nonsequential procedures of Goering and Van Soest (1970). Lignin was determined on ADL follwing ADF analysis. Hemicellulose was calculated as the difference between NDF and ADF. Cellulose was estimated as the difference between ADF and ADL.

The different samples were also prepared for mineral analysis by a wet-ashing (Nitric-perchloric acids) method. The mineral concentrations were measured by Inductively Coupled Plasma Emission Spectroscopy (ICPS 2000, Shimadzu Co., Kyoto, Japan). All the glasswares used for analysis were washed with acid before use to remove the contaminating minerals.

Statistical analyses

The data were analyzed by Analysis of Variance and comparison of means by Duncan's multiple range test (Gomez and Gomez, 1983). Where appropriate, Student's t-test was also used to compare means.

Results and Discussion

Experiment 1

Table 1 shows the nutrient content of diets selected by sheep and goats from common pasture during rainy season. The CP of diets selected by the sheep was greater ($p < 0.01$) than that of diets selected by the goats (18.0% vs. 16.1%). Similar trend have been reported by Prigge et al. (1985) when sheep and goats grazed on improved and unimproved temperate pastures. When sheep and goats were offered with the same diet, the CP of the esophageal contents was higher in sheep than that esophageal contents from goats (Masson et al., 1989). Thus, their study showed that CP enrichment of the diets due to saliva contamination was higher in sheep. Furthermore, contamination was higher in diets with low protein content than those diets with high protein content, e.g. wheat straw vs. alfalfa hay.

TABLE 1. PROXIMATE ANALYSIS AND CELL WALL CONSTITUENT OF SHEEP AND GOAT DIETS ESOPHAGEALLY COLLECTED FROM COMMON PASTURE (DM BASIS)[1]

Item	Sheep	Goat	Statistical difference[2]
	.... (%)	....	
CP	18.0 ± 0.5	16.1 ± 0.3	**
Ash	12.3 ± 2.3	15.5 ± 1.3	ns
EE	2.6 ± 0.3	1.5 ± 0.5	*
CF	15.2 ± 0.9	17.2 ± 0.5	*
NFE	51.9 ± 1.7	49.7 ± 0.9	ns
NDF	45.2 ± 0.8	46.1 ± 1.7	ns
ADF	25.5 ± 2.0	27.6 ± 1.1	ns
HE[3]	19.7 ± 1.8	18.5 ± 0.7	ns
CE[4]	22.6 ± 1.6	23.8 ± 1.0	ns
ADL	2.9 ± 0.4	3.8 ± 0.3	*

[1] Values represent means ± SD.
[2] ns - not significant; * and ** - differ at $p < 0.05$ and $p < 0.01$, respectively.
[3] Hemicellulose; [4] Cellulose.

Ether extract was greater ($p < 0.05$) in sheep diets but no difference that was detected on NFE between the two diets. Earlier report (Wilson, 1976) indicated that grazing sheep select a higher nutritional value than the average for available forage.

The CF of the diets of sheep was lower ($p < 0.05$) by 2 units than that of goats diets. Apart from ADL which was higher ($p < 0.05$) in the diets of goats by almost one unit, all other fiber fractions resulted to insignificant differences between the two diets. However, the trend tended to be higher in the diets of goats. The discrepancies on grazing behavior of these two animals could lead to differences in their nutrient intake. Goats tended to utilize a broader spectrum of plants than sheep, generally exhibit a greater tendency to browse (Wilson et al., 1975). They grazed pasture from the top downwards, eating reproductive tillers and stalks as well as green leaf (Thompson and Poppi, 1990). Consequently, pastures grazed by goats would differ markedly in composition and structures from those grazed by other species.

The ash content and various mineral concentrations (table 2) of sheep and goats diets had no significant differences from each other. However, the trend was greater in Ca, Mg, Na, P, Fe, Mn, Mo and lower in K and Cu of the diets selected by goats. Previous data gathered from the same area through handplucking of the dominant grass species, stargrass, showed the following mineral contents: Ca, 0.55%; Mg, 0.25%; P, 0.38%; Cu, 16.5 mg/kg; and Zn, 25.9 mg/kg (Fujihara et al., 1992a and b). Thus, there was a possibility that the grazing animals consumed some forages with mineral content below the concentration of the dominant grass species. Nevertheless, both grazing animals could extract the same minerals from the same pasture but the present data should be viewed with some caution because of saliva's contribution to the mineral content of the diets (Holechek et al., 1982). The saliva of both animals had high concentration of P and Na (Hungate, 1966). The various mineral concentrations of both diets were on or just above the borderline of critical level of forage minerals set by McDowell (1985) for ruminants in the tropics. Eliminating the contribution of saliva to the mineral content of the diets, then there would be a deficiencies of some dietary minerals for animal needs.

TABLE 2. MINERAL COMPOSITION OF SHEEP AND GOAT DIETS ESOPHAGEALLY COLLECTED FROM COMMON PASTURE (DM BASIS)[1]

Item	Sheep	Goat	Statistical difference[2]
	.... (%)	....	
Ca	0.51 ± 0.05	0.67 ± 0.04	ns
K	0.93 ± 0.11	0.55 ± 0.02	ns
Mg	0.19 ± 0.01	0.23 ± 0.01	ns
Na	0.44 ± 0.04	0.49 ± 0.14	ns
P	0.27 ± 0.05	0.30 ± 0.05	ns
	.... (mg/kg)	....	
Cu	13.5 ± 2.7	11.7 ± 2.8	ns
Fe	510.9 ± 31.6	692.6 ± 59.1	ns
Mn	43.8 ± 3.7	65.8 ± 22.4	ns
Mo	11.7 ± 0.7	13.9 ± 2.6	ns
Zn	29.5 ± 6.7	29.2 ± 2.8	ns

[1] Values represent means ± SD.
[2] ns - not significant.

Experiment 2

Tables 3 and 4 show the data on proximate analysis and cell wall constituent of sheep diets as influenced by sampling methods. Under UP, the CP of the three diets collected were different ($p < 0.05$) from each other. The trend was fistulated > plucked > clipped samples. Under LP, the CP of the fistulated and plucked samples was greater ($p < 0.05$) than that of clipped samples. No difference was detected between fistulated and plucked samples. Nitrogen or CP (N × 6.25) contents of fistulated samples have been different from those of the forage fed to the animals due to the presence of N or protein in the saliva that contaminated the samples (Campbell et al., 1968). It was found in earlier study that the CP of fistulated samples was above by 3.6 and 4.8 units (DM basis) over plucked and clipped samples (Ishizaki et al., 1981). This N contamination of samples may be minimized by maintaining fistulated samples on diets of N content similar to that of forage to be sampled (Mayland and Lesperance, 1977).

Ash content was greater ($p < 0.05$) in fistulated samples than those plucked and clipped samples for both pastures. The difference between plucked and clipped samples was insignificant. Similar trend was observed by earlier workers (Hoehne et al., 1967; Campbell et al., 1968; Ishizaki et al., 1981); higher value for ash under the fistulated samples due to saliva contamination.

Ether extract of fistulated and plucked samples was lower ($p < 0.05$) than that of clipped samples for both pastures. No difference that was detected between plucked and fistulated samples. Earlier study (Campbell et al., 1968) showed that fistulated and plucked samples had similar ether extract values on purestand of Midland bermudagrass and with a mixture of native grasses. On the other hand, the three sampling methods were significantly different from each other collected at kikuyugrass (*Pennisetum clandestinum*) pasture (Ishizaki et al., 1981).

Nitrogen-free extract was greater ($p < 0.05$) in plucked samples than those of clipped and fistulated samples of both pastures. The difference between clipped and fistulated was insignificant. It was a fact that young plant parts had a high concentration of soluble nutrients. The low content of NFE on fistulated samples was due partly to enzymatic digestion during mastication.

The CF of the three diets from UP collected by various methods was different from each other, in the order of clipped > plucked > fistulated samples. Under LP, the CF of clipped samples was greater ($p < 0.05$) than those plucked and fistulated samples but no difference was detected between plucked and fistulated samples. The differences of diets on fiber constituents (NDF, ADF, hemicellulose and cellulose) as affected by sampling methods were insignificant from each other. Only ADL was greater ($p < 0.05$) in clipped samples than that of plucked and fistulated samples. The difference of plucked and fistulated samples was insignificant. The general trend for the fiber constituents of the pasture as affected by sampling methods was clipped > plucked > fistulated samples (Ishizaki et al., 1981).

TABLE 3. PROXIMATE ANALYSIS AND CELL WALL CONSTITUENT OF SHEEP DIETS AS INFLUENCED BY SAMPLING METHODS (UPLAND PASTURE, DM BASIS)[1]

Item	Plucked	Clipped	Fistulated
		(%)	
CP	$7.3^a \pm 0.5$	$6.4^b \pm 0.2$	$9.5^c \pm 0.5$
Ash	$9.1^a \pm 0.9$	$9.6^a \pm 1.0$	$12.4^b \pm 0.4$
EE	$1.6^a \pm 1.2$	$2.4^b \pm 0.2$	$1.2^a \pm 0.1$
CF	$15.4^a \pm 0.5$	$19.3^b \pm 1.0$	$12.6^c \pm 0.4$
NFE	$66.6^a \pm 0.9$	$62.3^b \pm 2.0$	$64.3^b \pm 0.6$
NDF	57.1 ± 0.6	59.9 ± 0.4	55.8 ± 2.0
ADF	36.7 ± 3.2	39.5 ± 1.4	35.9 ± 1.7
HE[2]	20.4 ± 0.8	20.4 ± 2.1	19.9 ± 1.4
CE[3]	33.0 ± 1.4	34.9 ± 1.2	32.2 ± 1.8
ADL	$3.7^a \pm 0.2$	$4.6^b \pm 0.5$	$3.7^a \pm 0.2$

[1] Figures in each row having the same superscript are not significantly different ($p < 0.05$); values represent means ± SD.
[2] Hemicellulose; [3] Cellulose.

TABLE 4. PROXIMATE ANALYSIS AND CELL WALL CONSTITUENT OF SHEEP DIETS AS INFLUENCED BY SAMPLING METHODS (LOWLAND PASTURE, DM BASIS)[1]

Item	Plucked	Clipped	Fistulated
		(%)	
CP	$10.7^a \pm 0.3$	$8.7^b \pm 0.3$	$11.6^a \pm 0.6$
Ash	$10.4^a \pm 1.0$	$12.8^a \pm 1.5$	$14.5^b \pm 1.4$
EE	$1.7^a \pm 0.3$	$2.2^b \pm 0.2$	$1.5^a \pm 0.2$
CF	$14.2^a \pm 0.3$	$18.8^b \pm 0.2$	$14.1^a \pm 1.1$
NFE	$63.0^a \pm 0.7$	$57.5^b \pm 1.2$	$58.3^b \pm 2.1$
NDF	45.5 ± 2.2	49.4 ± 1.7	48.8 ± 2.1
ADF	32.8 ± 0.7	34.6 ± 1.4	33.9 ± 1.6
HE[2]	12.7 ± 3.3	14.8 ± 0.3	14.9 ± 1.8
CE[3]	29.3 ± 1.2	30.9 ± 1.3	30.3 ± 1.5
ADL	$3.5^a \pm 0.1$	$3.7^b \pm 0.1$	$3.6^a \pm 0.1$

[1] Figures in each row having the same superscript are not significantly different ($p < 0.05$); values represent means ± SD.
[2] Hemicellulose; [3] Cellulose.

Tables 5 and 6 show the mineral concentrations of sheep diets as influenced by sampling methods. Calcium, Na and P were lower ($p < 0.05$) for plucked and clipped samples than that of fistulated samples for both pastures. No difference was detected between plucked and clipped samples Similar trend was observed by Ishizaki et al. (1981) for P and Na and Gengelbach et al. (1990) for Ca and Na. It was suggested that fistulated samples should not be used to evaluate dietary P concentrations (Mayland and Lesperance, 1977). Along with Na, P was one of the major inorganic elements of sheep and goat saliva (Hungate, 1966).

TABLE 5. MINERAL COMPOSITION OF SHEEP DIETS AS INFLUENCED BY SAMPLING METHODS (UPLAND PASTURE, DM BASIS)[1]

Item	Plucked	Clipped	Fistulated
	.... (%)		
Ca	$0.16^a \pm 0.01$	$0.21^a \pm 0.03$	$0.39^b \pm 0.04$
K	0.29 ± 0.01	0.30 ± 0.06	0.27 ± 0.07
Mg	$0.08^a \pm 0.01$	$0.08^a \pm 0.01$	$0.14^b \pm 0.04$
Na	$0.02^a \pm 0.01$	$0.03^a \pm 0.01$	$0.48^b \pm 0.12$
P	$0.11^a \pm 0.01$	$0.14^a \pm 0.01$	$0.18^b \pm 0.01$
	.... (mg/kg)		
Co	$0.3^a \pm 0.01$	$0.7^b \pm 0.2$	$1.1^b \pm 0.2$
Cu	$8.3^a \pm 0.05$	$10.9^b \pm 2.3$	$10.4^b \pm 1.3$
Fe	$339.1^a \pm 35.4$	$918.2^b \pm 32.7$	$944.0^c \pm 99.2$
Mn	$54.7^a \pm 1.3$	$59.2^b \pm 1.2$	$60.8^c \pm 1.4$
Mo	$8.1^a \pm 0.5$	$9.0^b \pm 0.2$	$11.5^c \pm 2.1$
Zn	$20.6^a \pm 0.3$	$21.4^a \pm 1.2$	$26.6^b \pm 7.1$

[1] Figures in each row having the same superscript are not significantly different ($p < 0.05$); values represent means ± SD.

The differences in K concentration of the three diets from UP were insignificant from each other. Clipped and fistulated samples were greater ($p < 0.05$) in K concentration than that of plucked samples in LP. No difference that was detected between clipped and fistulated samples. The study of Ishizaki et al. (1981) showed the trend, clipped > plucked > fistulated samples (DM basis) whereas no differences from each other when organic matter basis was used. Gengelbach et al. (1990) observed no difference between clipped and fistulated samples on K concentration of different cool-season grasses.

Magnesium concentration of diets collected by plucked and clipped from UP was lower ($p < 0.05$) than that of fistulated samples. No difference was detected between plucked and clipped samples. Under LP, the Mg concentration of the diets was different ($p < 0.05$) from each other and the trend was fistulated > clipped > plucked samples. The observation of Gengelbach et al. (1990) was greater for fistulated than that of clipped samples while the reverse was observed by Ishizaki et al. (1981).

TABLE 6. MINERAL COMPOSITION OF SHEEP DIETS AS INFLUENCED BY SAMPLING METHODS (LOWLAND PASTURE, DM BASIS)[1]

Item	Plucked	Clipped	Fistulated
	.... (%)		
Ca	$0.15^a \pm 0.01$	$0.24^a \pm 0.01$	$0.31^b \pm 0.06$
K	$0.29^a \pm 0.03$	$0.48^b \pm 0.02$	$0.57^b \pm 0.21$
Mg	$0.11^a \pm 0.01$	$0.17^b \pm 0.01$	$0.22^c \pm 0.04$
Na	$0.02^a \pm 0.01$	$0.05^a \pm 0.01$	$0.58^b \pm 0.12$
P	$0.12^a \pm 0.01$	$0.18^a \pm 0.01$	$0.25^b \pm 0.05$
	.... (mg/kg)		
Co	$0.5^a \pm 0.01$	$1.8^b \pm 0.1$	$1.3^b \pm 0.3$
Cu	$8.2^a \pm 0.1$	$17.1^b \pm 2.8$	$16.1^b \pm 1.8$
Fe	$512.8^a \pm 48.3$	$1,035.3^b \pm 19.2$	$1,537.3^c \pm 65.5$
Mn	$25.8^a \pm 0.2$	$120.0^b \pm 6.5$	$128.5^c \pm 11.5$
Mo	$9.5^a \pm 0.1$	$15.1^b \pm 0.2$	$17.1^c \pm 1.7$
Zn	$20.6^a \pm 0.1$	$30.9^b \pm 0.3$	$49.9^c \pm 2.9$

[1] Figures in each row having the same superscript are not significantly different ($p < 0.05$); values represent means ± SD.

Cobalt and Cu concentrations were higher ($p < 0.05$) in clipped and fistulated samples than that of plucked samples for both pastures. No difference was detected between clipped and fistulated samples. The concentrations of Fe, Mn, Mo in both pastures were different ($p < 0.05$) from each sampling method and the trend was fistulated > clipped > plucked samples. Zinc concentration was lower ($p < 0.05$) in plucked and clipped samples than that of fistulated samples from UP. No difference was detected between plucked and clipped samples. Under LP, the trend of Zn concentration was fistulated > clipped > plucked samples ($p < 0.05$). In the study of Mayland and Lesperance (1977), fistulated samples had significantly higher concentrations of Co and Zn than the forage offered while small increases in K, Mn, Fe and Mo. The general observation was that fistulated samples had always high concentration of different minerals.

The pooled nutrient characteristics of sheep diets collected from UP and LP are shown in table 7. Crude protein and ash were greater ($p < 0.01$) in LP but lower ($p < 0.01$) in NFE compared to UP. The differences between the two pastures in term of EE and CF were insignificant from each other. The different fiber constituents of UP were greater ($p < 0.01$) including ADL ($p < 0.05$) than that of LP. In regards to minerals (table 8), only Ca and Na had no significant differences between the two pasture types. The P, K ($p < 0.05$). Mg and the different microminerals ($p < 0.01$) analyzed were greater in LP than that of UP.

TABLE 7. POOLED NUTRIENT CHARACTERISTIC OF SHEEP DIETS COLLECTED FROM UPLAND AND LOWLAND PASTURES (DM BASIS)[1]

Item	Upland	Lowland	Statistical difference[2]
.... Proximate (%)			
CP	7.7 ± 1.6	10.3 ± 1.5	**
Ash	10.4 ± 1.8	12.6 ± 2.1	**
EE	1.7 ± 0.6	2.0 ± 0.4	ns
CF	15.8 ± 3.4	15.7 ± 2.7	ns
NFE	64.4 ± 2.1	59.4 ± 3.0	**
...... Fiber fraction (%)			
NDF	57.6 ± 2.1	47.9 ± 2.1	**
ADF	37.4 ± 1.9	33.8 ± 0.9	**
HE[3]	20.2 ± 0.3	14.1 ± 1.2	**
CE[4]	33.4 ± 1.4	30.2 ± 0.8	**
ADL	4.0 ± 0.5	3.6 ± 0.1	*

[1] Data from the three collection methods were pooled together; values represent means ± SD.
[2] ns - not significant; * and ** - differ at $p < 0.05$ and $p < 0.01$, respectively.
[3] Hemicellulose; [4] Cellulose.

The individual nutrient content of UP was lower than that of LP due to the type of vegetation and land management. The LP was not a permanent pasture. It was used for rice production for almost one third of a year. Inorganic fertilizer was broadcasted as a part of rice management. Whereas, the UP received no pasture management thus the loss of nutrients due to defoliation was continous exaggerated by its loss of nutrients due to run off during rainy season. Nevertheless, both pastures need a supplementation strategies as supported by the production and reproduction data gathered by Domingo et al. (1990) from the same sheep farm.

TABLE 8. POOLED MINERAL COMPOSITION OF SHEEP DIETS COLLECTED FROM UPLAND AND LOWLAND PASTURES (DM BASIS)[1]

Item	Upland	Lowland	Statistical difference[2]
...... Macromineral (%)			
Ca	0.25 ± 0.1	0.23 ± 0.1	ns
K	0.29 ± 0.01	0.45 ± 0.1	*
Mg	0.10 ± 0.03	0.17 ± 0.05	**
Na	0.18 ± 0.3	0.22 ± 0.3	ns
P	0.14 ± 0.03	0.18 ± 0.1	*
...... Micromineral (mg/kg)			
Co	0.7 ± 0.4	1.2 ± 0.6	**
Cu	9.9 ± 1.4	13.2 ± 4.9	**
Fe	733.7 ± 342.0	1,028.5 ± 512.3	**
Mn	58.2 ± 3.2	91.4 ± 57.0	**
Mo	9.5 ± 1.8	13.9 ± 3.9	**
Zn	22.9 ± 3.3	33.8 ± 14.9	**

[1] Data from the three collection methods were pooled together; values represent means ± SD.
[2] ns - not significant; * and ** - differ at $p < 0.05$ and $p < 0.01$, respectively.

Conclusion

This study shows some nutrient discrepancies between the diets of Philippine indigenous sheep and goats when grazed in a common pasture. Sampling method influences the nutrient characteristics and mineral composition of the diets of indigenous sheep. Both native pastures show some nutrient deficiencies, thus imply a supplementation strategies to meet the animal's nutrient requirements.

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