

## Characterization of Ruminant Husbandry Systems in Protected Areas of Batanes Islands, Philippines

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### ABSTRACT

The Batanes islands are few of the remaining preserved natural landscape and seascape areas in the Philippines. The major source of income in the islands is ruminant husbandry. The study was conducted to document and assess the traditional husbandry systems in these areas with the specific aim of providing baseline data for policymaking and future intensification projects. Six villages were identified as study sites, and ten households per village with a total of 60 respondents were interviewed using a guided questionnaire. Findings from this survey revealed two husbandry systems namely: pasture based and mixed pasture based systems. The dominant livestock species in the islands were cattle, goat and carabao, quantified as Total Livestock Unit (TLU). The major reason for raising ruminants in the islands was for food. Tethering, feeding and breeding were the major husbandry activities done by the heads of the families and their children. Pasture based system mostly relied on vegetation in the wild and grassland areas while mixed-pasture based system added more plant protein sources from crop residues including cassava, sweet potato and corn. There were no feed and fodder materials coming from external feed resources. In general, traditional ruminant husbandry systems are still practiced by most farmers in Batanes. These practices contribute to the maintenance of the good landscape in the many areas of the islands.

*Keywords:* ruminant husbandry systems, protected areas, Batanes islands

### INTRODUCTION

The Batanes group of islands, located at the northern-most tip of the Philippines, is one of the remaining areas of the country known for its natural landscape, seascape preservation, and biodiversity conservation (Gonzalez *et al.* 2008). The people in the province, being aware that it is

climatically and geographically different to the mainland, have established crop and livestock production systems adaptable to the environmental conditions (Uy *et al.* 2008).

Native inhabitants of the islands are called the “Ivatans.” They had lived there for a number of years and had used indigenous knowledge in their land use practices and livestock husbandry systems (Blolong, 1996). The use of natural vegetation and the raising of ruminant in the pasture areas led to the establishment of agricultural and cultural landscapes across the islands. These unique landscapes have been declared as natural protected areas for landscape conservation and biodiversity preservation. Due to increase in population paralleled with increase in demand for animal-based protein, the islands' protected areas with pasture area cover are now at high risk of intensification and degradation.

Livestock husbandry, particularly ruminant production and agriculture, is the main source of income in the province. The increase in the demand for ruminants in the mainland has pushed local people in the islands to intensify their ruminant production and meet the demands. Ruminant intensification has caused positive and negative impacts to the populace and the preserved environment. Hence, the government's ruminant intensification projects have been directed to the intensification of production systems and meeting the growing demands.

Proper documentation of the ruminant husbandry systems is important in order to guide policy makers and project implementers on the proper implementation of interventions for the protected areas. Hence, this study was conducted and focused on the present state of ruminant production systems in the province of Batanes, which is still less surveyed and not properly documented. Specifically, the study aimed to document and to characterize the management practices of the ruminant production systems in the group of islands.

## MATERIALS AND METHODS

### *Research Study Area*

The study was conducted from May to July 2010 in Batanes, the smallest province of the Philippines (Dayo *et al.* 1997; Uy *et al.* 2008). It is located between 121°45' to 122° 22' East and 20° 15' North, and is closer to Taiwan than the mainland of the country. The province is surrounded by water, in the north by Bashi channel, in the east by the Pacific Ocean, in the west by the South China Sea and in the south by the Balintang channel. Topographically, the island is characterized by very distinctive landscapes with steep cliffs, rolling hills, deep canyons, undulating plains and boulder-lined shores (Uy *et al.* 2008) (Figure 1). Batanes is composed of ten islands and islets. Three big islands, namely: Sabtang, Batan and Itbayat are being inhabited (Madulid, 2004). In addition, the province is divided into six municipalities—Basco, Mahatao, Ivana, Uyugan, Sabtang and Itbayat. The

first four municipalities are located in Batan while the last two are situated in Sabtang and Itbayat Island, respectively. There are 29 barangays or villages distributed across the six municipalities. For this study, six villages were selected according to similar characteristics that included the number of ruminants, size of pasture area, accessibility of the sites to local transport, and willingness of the farmers to be interviewed for the study.

### *Climate in Batanes*

Batanes climate ranges from humid oceanic to sub-tropic. It is coldest in December with an average air temperature of 14°C and warmest in May with 30-39°C. Non-summer months have high variable annual precipitation brought by typhoons. Precipitation in the northern part of the island is highest compared to the precipitation in the south. During the onset of colder months, weather is foggy caused by cold polar air from the north meeting warm moist air from the south (<http://www.uyuganbatanes.com/batanes.html>).

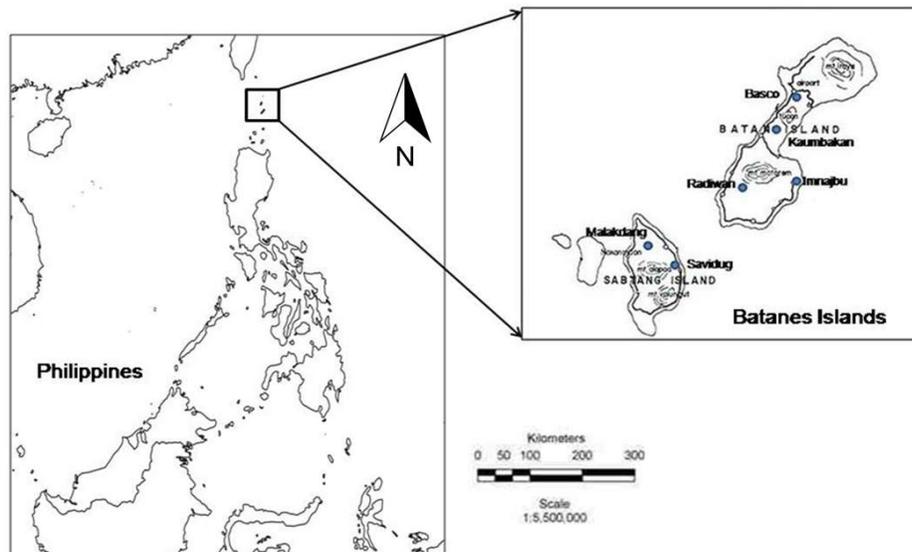


Figure 1. Location of the study sites in six villages: Imnajbu, Radiwan, Kaumbakan, Basco, Malakdang and Savidug in Batanes, Philippines

### *Ruminant Management Data Gathering*

A questionnaire-based interview was conducted in six selected villages. Ten representative households (HH) were randomly selected from each village, producing a total 60 respondents, also referred to as farmers ( $n = 60$ ). The questionnaire comprised a combination of open-ended and close types of questions. Questions asked pertained to the following: species of animals raised; number of animals per species; reasons for keeping animals; yearly production; breeding practices; and management

of animal health, animal nutrition and pastures.

#### *Data Analysis and Interpretation*

The data was analyzed and interpreted using the Microsoft Excel 2007® software.

### RESULTS AND DISCUSSION

#### *Respondent's General Profile*

Sixty respondents (n = 60) from six villages were randomly selected and interviewed for the study. The mean family size per interviewed household (HH) is 5 members (SD = 2). Majority of the heads or fathers in the family were able to graduate high school (48%). Many were also able to enter and/or graduate in college (42%). Only a few stopped after elementary education (17%). The lowest percentage of participants was recorded as professionals (3%). On the other hand, most mothers in the family graduated college (42%) or finished high school (40%). Moreover, the children of the respondents who were at age attended primary and secondary schools. Therefore, none of the respondents are illiterate. The average age of the respondents was 60, were the oldest respondent is at age 89 and the youngest respondents aged 31.

#### *Sources of Income*

There are two main sources of income in Batanes, namely: agricultural and non-agricultural. Results showed that 25% of the total respondents were mainly dependent on agricultural income (100:0) while only 3% of them did not receive income from any agricultural activities (0:100). Other respondents chose other proportions according to the income obtained from agriculture versus non-agriculture (Figure 2).

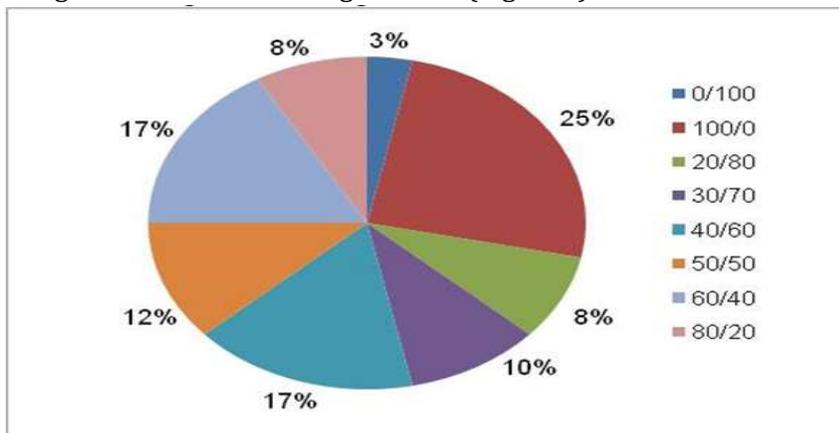


Figure 2. Proportion of agricultural and non-agricultural income by the respondents

### *Agricultural Income*

Ruminant production is one of the major sources of agricultural income in Batanes. There were different reasons for raising ruminants. Figure 3 shows that majority of the respondents raised ruminants as their source of income (n = 59) and as source of food (n = 48). On the other hand, very few answered tradition as their reason (n = 2). For this question, respondents were allowed to have multiple answers.

Respondents obtained their income from other agricultural products. Vegetables and root crops comprised 36% and 35% of these incomes, respectively. In addition, some respondents depended on fishing (17%). A few resorted to planting maize (4%) and other assorted agricultural products including rice, banana, sugarcane, pineapple, fruit-bearing trees and to wine-making through sugarcane juice called *basi* (8%).

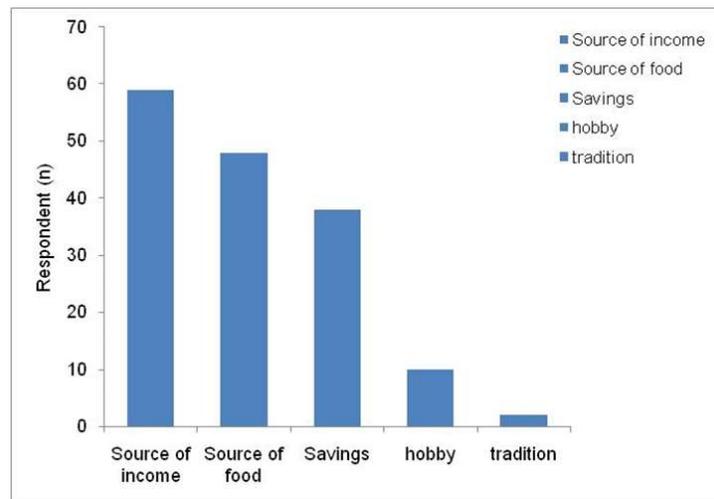


Figure 3. Reasons for raising ruminants in Batanes

### *Non-Agricultural Income*

The respondents performed other functions in the villages aside from being farmers. Some of them worked in government agencies (23%) and/or as village local officials (17%). The others acquired non-agricultural income by working as carpenters (6%), laborers (11%) and motorcycle drivers for public transportation (5%). Meanwhile, a few sourced their income from contractual jobs (3%), from pension as retired government employees (3%), and from store business (3%). Cottage rentals and small catering services were also mentioned as other sources of non-agricultural income.

### *Ruminant Production Systems*

There are two ruminant production systems found in Batanes, namely: the pasture-based production system (Figure 4a) and the mixed-pasture production system (Figure 4b). The first system includes various activities i.e. tethering, feeding, free roaming and communal corralling. It depends on feeding ruminants in pasture vegetation including leaves harvested from trees, grasses and shrubs species found in the site. On the other hand, the second system involves feeding of ruminants similar to the first system but also includes agricultural crops residues.

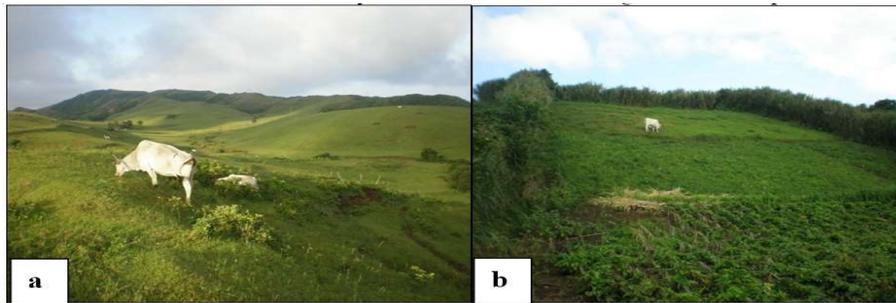


Figure 4. Ruminant production systems in Batanes (a) pasture based production, (b) mixed pasture production system

### *Ruminant Management*

#### *Species Studied*

The dominant species of ruminants in Batanes are cattle, goat and carabao. As shown in figure 5, cattle comprised the largest population with 6,766 heads, followed by goats 3,870 heads and carabao 3,008 heads (PSA, 2016). The studied species were categorized according to age and sex: adult-male, adult-female, young-male and young-female. Results show (figure 6) that adult female cattle were greater in number with 182 Total Livestock Unit (TLU), followed by young female cattle, and adult female cattle with 77 TLU and 67 TLU, respectively. These types of ruminants were greater in number since farmers would retain the animals in the herd for production and replacement purposes. On the other hand, males of different breeds were smaller in number since farmers would sell these animals to avoid inbreeding in their herd.

The dominant species in the islands where the study was conducted are cattle and goat. Farmers obtained income from sales of live animals and meat products while some of these animals were utilized for home consumption. This kind of livelihood is similar for farmer in other countries. In Kenya, for example, the same ruminants provide income to small hold-farmers by producing milk (Orodho, 2006; Kosgey *et al.* 2008; Budak *et al.* 2005). Moreover, small ruminants such as goat provide

regular cash income and insurance against emergencies (Kosgey *et al.* 2008).

Cattle and goat population decreases especially during drought seasons from the middle of April to late July. During this time, farmers are forced to sell or slaughter their animals due to lack of fodder in the pasture area and not enough drinking water in the fields. A cattle disease called *stephanofilariasis* (per communication from the provincial veterinarian) which resembles other filarial cattle diseases was present in the study sites according to two respondents. Animals infected with the disease would be sold or slaughtered. Definitive diagnosis and treatment of the said disease was still unclear during the conduct of this study. Thus, it might have still continued to infect healthy animals.

### *Management Activities*

There are three common management activities involved in ruminant production: tethering, breeding and feeding. As observed during the conduct of the study, tethering was usually done by the families' heads with the help of their children. On the other hand, breeding was mainly performed by the fathers (heads). Feeding of ruminants involved a cut and carry approach participated by all members of the family (Figure 6).

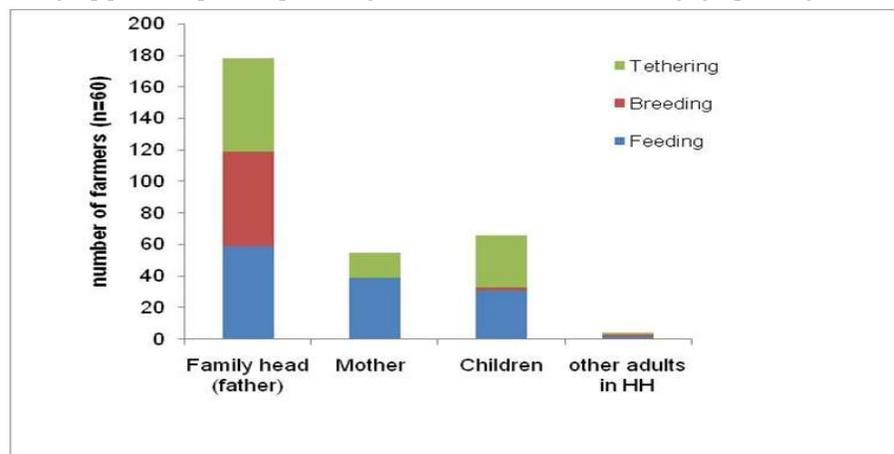


Figure 6. Involvement of family members in different activities in ruminant husbandry

All studied ruminants were tethered (Figure 7). However, some respondents practiced a combination of tethering and free roaming for their cattle, goat and carabao. In addition, respondents put their ruminants in communal pasture islands called *Ivohos* for cattle and *Doquey* for goats where the animals could freely roam.

Ruminants were acquired mostly by buying them from other farmers in the same village or from neighboring villages (Figure 8). Other respondents reported that their ruminants were offspring of their own breeding stocks. "*Paalaga system*" was another means of acquisition of

ruminants. This is an old traditional way of acquiring animals without money involved. Usually, female animals are borrowed and taken care of by another farmer. The first offspring of the animal will be given to the care taker and the next offspring will go to the owner. The owner has the full right on the borrowed female animal.

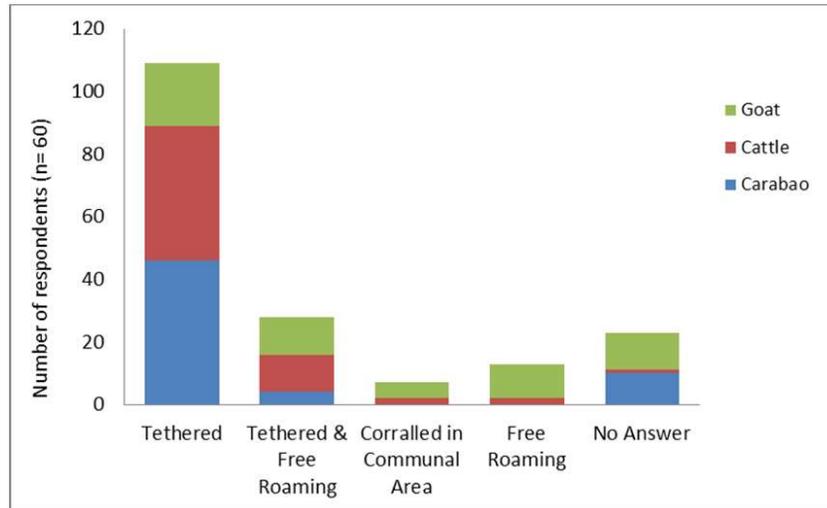


Figure 7. Method of keeping ruminants in Batanes

Acquisition of ruminants included dispersal from government agency, gift from parents or grandparents and exchange of animals with other type or breed. Majority of the animals were procured in the early 1990's. Cattles were acquired between 1960 and 1969, while goat breeds were acquired from the year 1990. In addition, carabaos were obtained between 1970 and 1980.

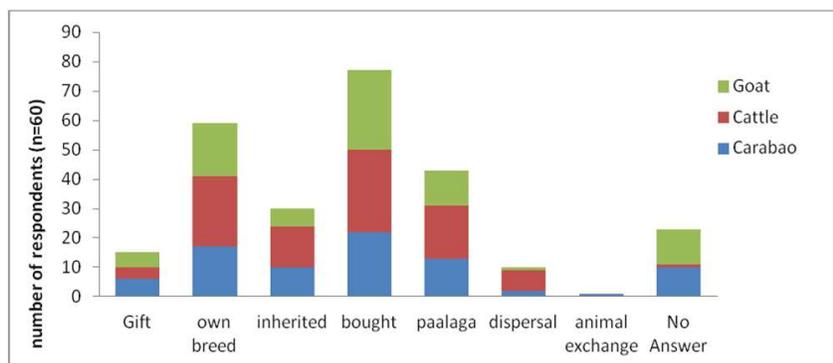


Figure 8. Mode of acquisition of studied ruminants

The main purpose of raising ruminant was to earn income by selling them alive (Figure 9). Cattle and carabaos would be sold to traders (middlemen) and brought to the mainland. Goats, on the other hand,

would be sold in local villages only. Some respondents would slaughter their cattle and part of the meat would be sold in the local markets. Only less meat from goats and carabaos would be available in the market because only a few people in the island eat these types. Meat from goats was mainly used for farmers' consumption. The supply is higher during typhoon seasons when fish would tend to be expensive and limited.

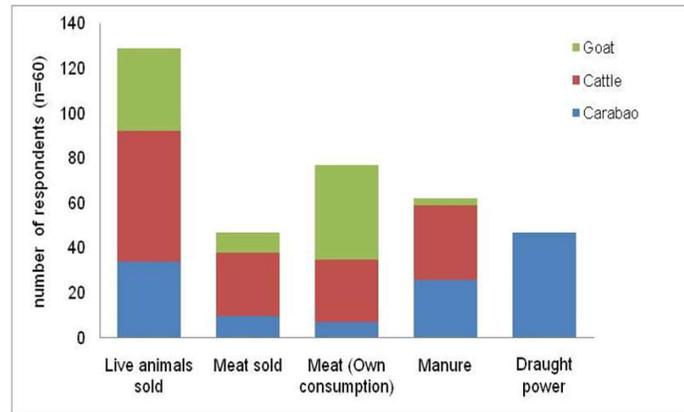


Figure 9. Purpose of raising ruminants in Batanes Islands

Meanwhile, most farmers used cattle and carabao manure to fertilize their agricultural fields. Only a few used goat manure. On the other hand, carabaos were utilized as draft powers in the field to prepare the land for planting crops and to transport feedstuff and other agricultural products to the market place. Other production purposes including milk, hair and leather were not employed. Some respondents tried to produce milk from cattle and goat, but were not successful due to lack of technical know-how.

### *Ruminant Breeding*

The respondents were asked about the selection criteria in choosing breeding male and female animals. Majority of the farmers answered that breed, body conformation and body size are the main criteria used in selecting breeding animals regardless of sex. On the other hand, age, behavior, production history and health were only minor considerations. Prolificacy and productivity of female ruminants were also considered while color was not a major selection criterion both for male and female animals.

The traditional selection criteria involve the selection of male and female ruminants based on their physical or phenotypic characteristics. According to Kosgey *et al.* (2008), body size and performance are important traits in breeding choices. A related study in Amman, Jordan showed that farmers were more subjective rather than objective in their selection criteria for breeding purposes (Tabbaa and Al-Atiyat, 2009). Breed, body conformation and body size were the first criteria that farmers

looked into, while age, production history and health were not major considerations. In contrast to the responses gotten from this study, color was a major criterion in the selection process of African Ankole Longhorn cattle (Ndumu *et al.* 2007).

Sources of breeding ruminants were the neighboring farmers in the village. Some respondents borrowed breeders and returned them after successful breeding. Moreover, some breeders were taken from the respondents' herds by careful selection method. Male ruminant breeders were obtained through government dispersal programs and breeding stations. Some respondents purchased their breeding ruminants from other villages while others were acquired as gifts.

The interview also revealed three methods of breeding cattle in Batanes: natural method (70%), artificial insemination (4%) and combination of both methods (26%). Farmers would still rely on natural method of breeding since artificial insemination is not yet fully implemented due to problems regarding preserved semen availability and the technical knowledge of technicians. Furthermore, according to the farmers, natural mating has higher conception rate than artificial insemination.

Fifty percent (50%) of the respondents purported that they experienced seasonal changes in breeding and reproduction in all studied ruminants. However, the other half of the respondents stated that they did not experience any changes. In the study conducted in Egypt, seasonal changes affected the semen quality of Zaraibi goats during winter and spring season (Barkawi *et al.* 2005).

Records show that the average number of offspring born alive in the last five years was five, seven and three heads for cattle, goat and carabao, respectively. On the other hand, the average female offspring kept for replacement purposes were three heads for cattle, four heads for goat and two heads for carabao.

Most of the respondents (70%) did not experience incidence such as abortion with their female ruminant animals. The percentages of those whose female carabaos, cattle and goats experienced abortion were minimal: 13%, 25% and 12%, respectively. However, rectal and vaginal prolapse was the major problem experienced by most farmers during pregnancy and giving birth. Prolapse is common in the island since pregnant animals are tethered in hilly pasture areas during the pregnancy period (Narciso, 2010 pers. comm.). Gravitational pull due to sloping stand and bank or hillside are probable forces that may lead to uterine or vaginal prolapse (Noakes *et al.* 2001).

Longevity of breeder ruminants varies for every type, age and species of ruminants. According to the respondents, male adult ruminants could stay in the farm as breeders for up to five years. Breeding performance of breeders would serve as basis for its longevity which may reach up to 20 years. Specifically, longevity of goats in the farm would depend on their purpose/s (i.e. for breeding purposes: 6-10 years or for food: 3-5 years).

### *Ruminant Nutrition*

Results of the study showed that the most common method of feeding ruminants was a combination of grazing and cut and carry of fodder. In particular, this method was more practiced with cattle and carabao: 52 and 44%, respectively. However, a few respondents answered that they did the same for goat (4%). Majority of the respondents would graze cattle and carabao in the pasture area every day. Supplemental cut and carry would be usually done during drought season since the quantity of grasses is limited. Stall feeding and zero grazing of ruminants in the household were not practiced in the island. In contrast, in other countries like Kenya, stall feeding with zero grazing is the major practice of farmers, and it gives high value to fodder plants (Orodho, 2006).

As observed, grasses, shrubs and trees were the main sources of fodder in the islands. Farmers would not buy any other type of feed for supplements unlike in the feeding practice in South Eastern Yemen where farmers purchase external fodder and other type of feed supplements for their animals in its protected area, the Hawf (Gonzaga, 2008). Moreover, farmers would give different types of fodder supplements to milking young animals, adult and pregnant animals (Gonzaga, 2008). In this study, findings show that ruminants would eat the same type of fodders available in the pasture area. There were no differences in fodder type given to the studied ruminants in cut and carry method. With regards to feeding of animals according to sex types, some farmers aforementioned that no differences in feeding male and female ruminants were observed in the study sites. However, during fattening period of ruminants, especially for male cattle and goat, farmers would feed the animals with young leaves of antipolo or “tipoho” tree species (*Artocarpus spp.*), and napier grass (*Pennisetum purpureum Shumach.*). The ruminants would be fed with these fodders every morning and every afternoon for a minimum of three months prior to selling of the animals. Farmers observed high weight gain, good body conformation, big size, shiny hair coat and good quality meat. Cattle which were conditioned and fattened with *tipoho* leaves and *napier* grass had good quality meat with regards to tenderness, color and taste, according to the farmers. Young leaves of tipoho would be collected from the wild and napier grass would be gotten from the pasture fields or harvested from plantation fields. Young leaves could be also picked from trees and shrubs growing in the wild and nearby pasture areas. No concentrates or any external fodder such as corn, processed feeds, rice bran was given to any ruminants in the islands. Some of the farmers also applied this traditional way of fattening carabaos and goats to other animals and observed the same effects.

According to the respondents, there were no differences in terms of feeding male and female ruminants. However, for male cattle, a different feeding strategy was practiced. Supplemental feeding using cut and carry would be given aside from the grasses in the field. This approach was

especially done during the conditioning and fattening stage and would last for approximately three months. Some respondents observed that young ruminants were selective in eating grasses, leaves from trees or shrubs. However, the animals would become non-selective as they grow older.

## CONCLUSION

The ruminant husbandry in Batanes islands contributed to the household income and nutritional needs of the farmers. Pasture based and mixed pasture based were the two most adopted husbandry systems. Ruminants relied more on natural vegetation in the pasture areas, as well as on indigenous trees and shrubs as fodders. Hence, breeding and nutritional management are still based on traditional ways of rearing livestock, and these traditional ruminant husbandry systems, in turn, contribute to the landscape maintenance and the preservation of the natural landscape and seascape of the islands.

## RECOMMENDATIONS

- Creation and strict implementation of a pasture management plan at the provincial and local government unit.
- Strict implementation of policies and regulations by the local government unit.
- Continued practice of traditional ruminant husbandry systems is highly recommended.
- Long term research and monitoring of the communal pasture areas on their dynamics and the various impact of ruminants to the environment
- On site feeding trial of *Artocarpus spp.* combined with *Pennisetum purpurium Shumach* during fattening period of cattle and goat in comparison to other feeding regimens used.

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