

Goat Farm Performance in Northern Mindanao, Philippines

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Abstract—Goat has always a place in most of the farming systems in the Philippines. It may have a minor role, but their importance in the rural life had long been recognized, so that the condition in which they are kept must be assessed. A study was conducted to evaluate the performance of backyard and commercial farms in the northern Mindanao Region. Provinces included were Bukidnon, Misamis Oriental and Misamis Occidental. Site identification was based on goat population. The following were gathered from 34 backyard and 5 commercial farms: average doe per farm, kidding index, kidding size, kidding interval, type of birth, sex ratio of kids, birth status, of kids, average daily gain and mortality. Average number of doe per farm for backyard is 7 and 34 for commercial. There is a lower kidding index and kid size as against the national average both for backyard and commercial. Kidding intervals in the backyard is shorter than the national average, but the commercial is longer by 13.63 days than the national. Birth type for backyard is dominated by single tone followed by twins and triplets. The commercial has similar trend on birth types. Backyard had higher percentage of kids born alive (99%) than commercial (96.55%) Kids in the Region have better growth performance than the national average both in backyard and commercial. Mortality among kids in the backyard below 1 month is higher while in the commercial highest mortality was in kids 1-3 months old. Results of the evaluation of goat farm performance showed that the major problems in goat raising in the region are poor kid performance, poor dam performance and high mortality. However, a lot of technological options which are products of previous researches are already available and can be delivered to goat raisers.

Index Terms—goat, kidding index, kidding interval, kid size, growth performance

I. INTRODUCTION

Over the years, the popularity of goat raising as an economic endeavor intensifies. Goat can provide extra food security and chances for people to survive when there is crop failure [1]. They constitute an important component in the traditional farming system in the tropics and sub-tropics [2]. Although animal performance

and breed characterization have been documented in some private and government farms, these initiatives are fragmented. The goat industry has yet to develop a monitoring system where production, reproduction as well as the socio-economic parameters can be quantified and analyzed even in a regional scale. Farmers must be assessed in terms of management practices employed and the level of technology adoption in addition to problems and constraints in raising goats so that a set of recommendations can be made to enhance farm performance.

Out of 17 regions the Philippines have at present, Northern Mindanao Region ranked only 9 in terms of total goat population [3]. It does not belong to the top producing regions [4] despite goat dispersal efforts initiated by the Local Government Units (LGU's) and Non-Government Organizations (NGO's). There is that need to beef up/increase goat population. However, reasons for low inventory have yet to be determined and quantified, thus this research.

Northern Mindanao is composed of 4 provinces namely Bukidnon, Misamis Oriental, Misamis Occidental and the Camiguin Island. However, only the first 3 provinces were considered in data collection.

The general objective of the study is to assess the performance status of goat farms in the Northern Mindanao Region of the country. Specifically it aims to evaluate the productive and reproductive performance of locally (backyard) and commercially raised goats, to identify technology gaps and possible technology options to improve farm performance.

II. METHODOLOGY

Fig. 1 Shows the methodology used in the study. It was categorized in major events from sites selection until feedback mechanism with different stakeholders.

A. Selection of Project Sites

The project was being implemented among backyard and commercial farms in Northern Mindanao area of the country. Three provinces with the highest goat population density were selected as focal sites. The provinces and the number of farms per province are

presented in Table I. There were 34 backyard and 5 commercial raisers who were regularly monitored and this number includes the buffer farms.

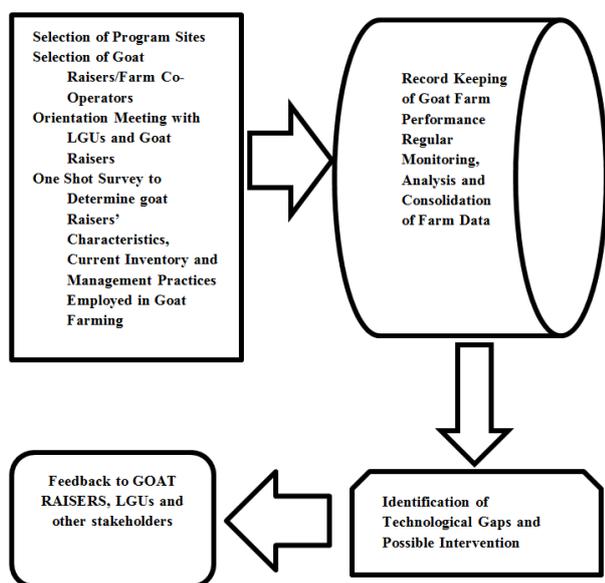


Figure 1. Methodology used in the study

TABLE I. NUMBER OF BACKYARD AND COMMERCIAL FARMS PER PROVINCE CONSIDERED FOR DATA COLLECTION

Provinces	Municipalities	Number of Goat Raisers	
		Backyard	Commercial
Bukidnon	Valencia City	7	1
	Malaybalay City	3	
Misamis oriental	Claveria	1	
	Tagoloan	4	
	Cagayan de Oro City	7	
	Opol	5	
	El Salvador		1
Misamis Occidental	Naawan	1	
	Ozamiz City	2	1
	Jimenez	3	
	Pana-on		1
	Aloran	1	
	Oroquieta City		1
TOTAL		34	5

Backyard raisers constitute more than 98.57 per cent of the country's total raisers [5]. It is in this context why there are more back yard raisers than commercial raisers included in the program. Commercial raisers are fewer but each had already established their own recording system, thus they were purposely chosen to represent each geographical area.

Buffer farms were also included to replace those who drop out from the program or for valid reasons failed to continue in data collection for the duration of the study. Hence, five backyard farms per geographical area and one commercial farm were added.

Existing goat farms from each province were considered based on the criteria set forth by the project. The list of goat raisers for the Northern Mindanao area was taken from the Provincial Veterinary Offices (PVO) of the three provinces.

B. Selection of Goat Raisers/Farm Co-Operators

A goat farm was identified as cooperators based on a) willingness of the farm owner to adopt and maintain the farm recording system being recommended by the project; b) willingness of the farm owner to share his farm performance records and allow publication of the data generated from the project; c) availability of 5 to 24 breeders does for backyard farms; d) availability of not less than 25 does for commercial farms ; and c) willingness to provide the necessary manpower to maintain farm records and follow the recommendation of the project implementers.

C. Orientation Meeting with the LGUs and Goat Raisers

During the first year of implementation, meetings with local government units (LGUs) specifically with the Municipal Agricultural Officer (MAO) and livestock technicians were conducted in different sites to discuss the rationale of the project and how the LGU's could be part to ensure its successful implementation. The assistance of the LGU technicians was requested especially in the monitoring of the farm data. Meetings cum seminars were also conducted with goat raisers who were selected as cooperators based on the criteria set by the project. During the meetings, monitoring forms were presented. They were taught on how to fill-up the forms to record farm's performance. Moreover, seminars on goat production were also conducted to improve farmers' knowledge on goat raising and to entice them to be cooperators of the project. Nonetheless, these meetings cum seminars also have MAO and technicians in attendance, in most cases.

D. One Shot Survey to Determine Management Practices Employed in Goat Farming

At the start, a one shot survey was made among the goat raisers in the different project sites. Another round was done towards the end to determine if there have been changes in management practices as an offshoot of this project.

E. Record Keeping of Goat Farm Performance

Three monitoring forms were provided to the goat raisers' to record the required parameters.

F. Regular Monitoring Analysis and Consolidation of Farm Data

To generate data and establish standards for goat farm, recording was done by the goat raisers. Every month, the project staff members monitored each farm to check on the farm records. Moreover, technical assistance was provided to the goat raisers by project staff whenever necessary. Data were checked, encoded in the appropriate worksheet and consolidated by the project staff.

G. Identification of Technological Gaps and Possible Intervention

The individual farm performance was critically examined. Problem areas were identified based on the farm performance data; technological gaps and possible interventions were identified to improve their performance.

III. RESULTS AND DISCUSSION

A. Productive and Reproductive Performance of Goats

The goat farm production performance between backyard and commercial is presented in Table II. A total two hundred forty three (243) and two hundred fifteen (215) does for backyard and commercial farms respectively were considered.

TABLE II. GOAT FARM PRODUCTION PERFORMANCE BETWEEN BACKYARD AND COMMERCIAL IN NORTHERN MINDANAO, PHILIPPINES

PARAMETER	BACKYARD			COMMERCIAL			
	Bukidnon	Mis. Or.	Mis. Occ.	Region	National	Region	National
No. of farms	10.00	18.00	6.00	34.00	143.00	5.00	32.00
No. of does	80.00	126.00	37.00	243.00	1,208.00	215.00	1,170.00
Ave doe per farm	8.00	7.00	7.00	7.00	8.40	43.00	41.00
Dam Performance							
Kidding index	1.55	1.48	1.41	1.48	1.50	1.33	1.40
Kidding size	1.42	1.45	1.44	1.44	1.60	1.47	1.50
Kidding interval	234.35	246.83	258.43	246.70	251.00	273.63	260.00
Type of birth (%)							
Single	60.00	60.18	55.88	58.69	48.00	60.42	51.40
Twin	37.78	35.40	44.12	39.10	46.60	36.81	45.10
Triplet	2.22	4.42		3.32	5.00	2.78	3.20
Quadruplet					0.40		0.30
Sex of kids (%)							
Female	52.34	54.54	36.00	47.63	49.80	52.79	49.50
Male	47.66	45.45	64.00	52.37	50.20	47.21	50.50
Birth Status (%)							
Alive	100.0	96.99	100	99.00	94.20	96.55	94.30
Dead		3.01		1.00	5.80	3.45	5.70
Growth Performance							
Weight of kids (kg)							
At birth	2.14	2.06	2.71	2.30	1.70	3.14	2.40
At 3 months	9.41	9.80	12.70	10.64	9.10	15.24	11.80
At 8 months	18.85	18.43	19.81	19.03	16.50	24.40	20.40
ADG (Gram)							
At 3 months	80.86	85.32	112.42	92.87	82.10	133.95	104.40
At 8 months	69.87	66.96	72.27	69.70	58.80	88.91	72.80
Mortality (%)							
Below 1 mo	9.93	5.62	14.29	9.95	8.70	7.89	9.50
1-3 mo		2.25		2.25	8.10	10.52	5.90
Weaning	2.84	2.25		2.55	4.60	1.75	5.90
Adult	1.25	1.59		1.42	5.30	4.65	6.90

B. Dam Performance

The primary indicators of dam performance are kidding interval and kidding index. The kidding interval of both backyard and commercial farms in Northern Mindanao is longer than the national levels with 246 and 273 days respectively. The national data is 242 for backyard and 260 days for commercial. The absence of bucks in some backyard farms and the practice of controlled breeding in some commercial farms contributed to the long kidding interval. Controlled breeding is intentionally done because commercial raisers wanted the succeeding kids to have higher birth weight. Although Northern Mindanao registered a longer kidding interval both in backyard and commercial farm, this is far better compared to the result obtained by Steinback [6] with 300, 348 and 355 days for local Tunisian, cross-

breeds and purebreds respectively where mating is allowed all year round.

The mean kid size is 1.44 for backyard farms and 1.47 for commercial, which is lower than the national data of 1.6. PCAARRD [7] reported a kid size of 1.5 and 1.75 for first and succeeding kiddings respectively. The situation was brought about by the highest proportion of singleton in backyard with 58.69% and 60.42% in commercial. This was followed by twins with 39.10 and 36.81% for backyard and commercial farms respectively, while the occurrence of triplets is only 3.32% for backyard farms and 2.78 in commercial. No incidence of quadruplet was recorded during the period of study.

Males are largely observed in backyard (52.37%) while females for commercial farms with 52.79%. This is a deviation from the national data where males dominate both in backyard and in commercial farms. Sexes of kids almost follow a 50:50 %ratio. The females were mostly used as replacement stock while the males are sold for slaughter or sold/used as breeder by other farms.

There is a minimal incident of kids born dead with 1% and 3.45 % for backyard and commercial farms respectively. This percentage is lower than the national record of 6.20% for backyard and 5.70% for commercial farms. Incidence of kids born dead is highly associated with poor body condition of the dam during gestation period that leads to weak kids upon kidding.

Northern Mindanao registered a kidding index (number of kiddings in a year) of 1.33 against 1.4 for the national. The kidding index reported by PCAARRD [7] is 1.5 in a complete confinement production system. Kidding index was directly affected by the availability of breeder bucks as observed among backyard raisers and the breeding practices employed in most commercial farms where breeding is intentionally delayed to produces kids with higher birth weights. Kids with higher birth weights have a better chance of surviving.

C. Growth Performance of Kids

The kids' performance was measured in terms of birth weight, weight at 3 months, and weight at 8 months. Average daily gain (ADG), both at 3 months and at 8 months was also measured.

- **Birth Weights.** In Northern Mindanao the average weight of kids at birth is 2.30kg for backyard and 3.14kg in commercial farms. This is higher than the national average of 1.8kg and 2.4kg for backyard and commercial farms respectively. This is due mainly to better bloodlines of the parents as a result of goat dispersal initiated by the government and some NGO's and better nutrition during pregnancy. Values reported by Stienbach [6] ranges between 2.5 to 3.5 kilograms across breeds.
- **Weight at 3 Months.** The same trend was observed on the weight of kids at 3 months with an average of 10.64kg at backyard level as against the national data of 9.10kg. On the other hand, the average weight of kids at 3 months in commercial farms is 15.24 and 11.80 kg for Northern

Mindanao and national data respectively. Steinbach [6] obtained similar results with the local Tunisian breed registering 10 kilograms at 3 months of age while pure and crossbreed with 17.

- Weight at 8 Months.** Eight (8) months from birth is considered as mature weight for goats. At this age, females can be bred if they are intended to be used as replacement stock, while the males can now serve as breeder buck or can be sold for slaughter. At 8 months the average weight of goats for backyard is 19.03kgs while the commercial had 24.40kgs. This big difference between the backyard and commercial data can be attributed to the kind of management employed by the backyard raisers and commercial farm owners. Generally, commercial raisers can afford to provide their animals with the proper amount of quality feeds than most of the backyard raisers. This can also be due to the purity of the bloodlines the commercial raisers maintained where most of them intent to sell their animals as breeding stock than purely for slaughter purposes. Animals in backyard are mostly native and cross of native and exotic breeds, whereas the commercial farmers have pure or crosses of exotic breeds. PCAARRD, [8] mentioned that weaning age is usually at 8 months with at a body weight of 15 and 20 kilograms for native and crossbreeds respectively.
- Average Daily Gain at 3 Months.** The average daily gain (ADG) of kids at 3months in the backyard and at the commercial level is 92.87 and 133.95 grams respectively (Table II), while the national average were only 82.10g for backyard and 104.40 grams for commercial farms. Steinbach (1988), obtained an average daily gain of 90 grams for the local and 150 grams for Alpine breeds.
- Average Daily Gain at 8 Months.** As expected, daily gain decreases as the animal matures. Northern Mindanao data show that animals in the backyard had an average daily gain of 69.96grams while those in the commercial had 88.91. However, on the national level, a much lower ADG were observed among animals both in the backyard and

commercial with 58.80 and 72.80 grams respectively. This result is higher than the findings of Escleto [4] were goats given 100% pure paragrass obtained an ADG of only 50grams. Escleto’s report [4] is even lower than the national average.

D. Mortality

Mortalities were categorized according to age or maturity of animals such as below 1 month old, 1-3months, weaning age and adult. At the backyard level, mortality of animals below 1 month, ages 1-3 months, weaning age and those classified as adult were 9.95%, 2.25, 2.55 1.42% respectively, whereas those in the commercial farms on the average had 7.89% for ages below 1 month, 10.52% for those 1-3 months, 1.75% those in the weaning age and 4.65% among adult animals. However, the national data on mortalities at backyard were 8.70, 8.10, 4.60 and 5.30% for ages below 1 mo., 1-3 months, weaning age and adult age respectively, At the commercial level, those animals below 1 month had 9.5 while those in the ages 1-3 months and weaning both had 5.90. Those in the adult category had 6.90.

Below 1 month old mortality was highest in backyard farms with (9.95%) while ages 1 to 3 months for commercial farm (10.52%) as compared to the national level of 9.50 % and 5.90%, respectively. The increase mortality is due to climatic condition during the conduct of study (drought) where roughage is scarce and of poor quality followed by the on-set of rainy season where goats have difficulty recovering weight losses. Goat also experience scouring and cough at the early part of the wet season. PCAARRD (2012) reported a 7% death among kids while only 5 and 3% among growing and matured animals.

E. Identified Technology Gaps and Possible Interventions

Table III presents the identified problems confronting goat raising, technological gaps and possible interventions. The three major problems that were identified based on mean values for Years 1, 2, and 3 among backyard farms were: (1) poor kid performance; (2) high mortality, and (3) poor dam performance.

TABLE III. TECHNOLOGICAL GAPS AND POTENTIAL INTERVENTIONS IN BACKYARD GOAT FARMING

Problems	Data Indicator Philippines (mean value of Years 1 to 3)	Reasons for Low Performance	Technological options	Specific Technological options
I. Poor kid performance				
A. Low birth weight (<1.75 kg)	2.30 Kg	• Poor genetic potential of the animals	• Infusion of good genetics	<ul style="list-style-type: none"> • Culling & selection • Yearly buck rotation • Adoption of breeding plan
		• Poor feeding and nutrition of does	• Improve feeding and nutrition	<ul style="list-style-type: none"> • Development of pasture • Mineral supplementation • Flushing before kidding • Supplementation with foster milk
		• Poor health condition of does	• Doe health monitoring	<ul style="list-style-type: none"> • Improve feeding and nutrition • Pre-partum deworming before kidding • Post-partum deworming
B. Low mature weight (<20kg at 8 months of age)	19.03 kg	• Poor genetic potential of the animals	• Infusion of good genetics	<ul style="list-style-type: none"> • Adoption of breeding plan • Culling & selection • Regular replacement of bucks
		• Poor feeding and nutrition	• Improve feeding and nutrition	<ul style="list-style-type: none"> • Development of pasture • Mineral supplementation

				<ul style="list-style-type: none"> ● Flushing before kidding ● Supplementation of foster milk ● Creep feeding for kids ● Year-round feeding and nutrition program
		<ul style="list-style-type: none"> ● Poor health condition of does and kids 	<ul style="list-style-type: none"> ● Doe/kid health monitoring 	<ul style="list-style-type: none"> ● Improve feeding and nutrition ● For Doe: Pre-partum and Post-partum deworming ● Deworming of kids with heavy parasite infestation at 3rd week after birth and at 3 months of age
C. Low ADG (83.2 grams)	92.87	<ul style="list-style-type: none"> ● Poor feeding and nutrition of animals 	<ul style="list-style-type: none"> ● Improvement of feeding and nutrition 	<ul style="list-style-type: none"> ● Development of pasture ● Mineral supplementation ● Flushing before kidding ● Supplementation of foster milk ● Creep feeding for kids ● Year-round feeding and nutrition program
D. ADG@3months (56.9 grams)	69.70	<ul style="list-style-type: none"> ● Poor feeding and nutrition of animals 	<ul style="list-style-type: none"> ● Improvement of feeding and nutrition 	<ul style="list-style-type: none"> ● Development of pasture ● Mineral supplementation ● Use of totally mixed ration (TMR) ● Year-round feeding and nutrition program
2. High mortality				
A. High mortality of kids (<3 months old, 9.5%)	9.95	<ul style="list-style-type: none"> ● Exposure to extreme weather conditions ● Poor animal management ● Feeding 	<ul style="list-style-type: none"> ● Proper management ● Transitory mgt. program from pre-weaning to growing ● Application of appropriate husbandry practices 	<ul style="list-style-type: none"> ● Adaptation of innovative technology to cope with changes in the environment ● Mgt. of kidded does ● Mgt. of newly born kids
B. High mortality of kids (1-3 months old, 8.7%)	2.25	<ul style="list-style-type: none"> ● Nutrition ● Health (worms) 	<ul style="list-style-type: none"> ● Proper Feeding ● Follow strategic deworming Presentlyng 	<ul style="list-style-type: none"> ● Weaning ● Creep feeding of kids ● Provision of processed feeds ● Feeding of quality legumes & grasses ● Segregation of animals by sex and physiological stage ● Deworming
C. High weaning mortality (4.7%)	2.55	<ul style="list-style-type: none"> ● Improper/ lack of appropriate housing facilities 	<ul style="list-style-type: none"> ● Construction of proper housing 	<ul style="list-style-type: none"> ● Provision of appropriate housing
D. High growing/ adult mortality	1.42	<ul style="list-style-type: none"> ● Poor health 	<ul style="list-style-type: none"> ● Determine causes of mortality 	<ul style="list-style-type: none"> ● Strategic deworming
3. Poor dam performance				
A. Low Kidding index	1.48	<ul style="list-style-type: none"> ● Controlled breeding 	<ul style="list-style-type: none"> ● Breeding plan (schedule and breeds to use) 	<ul style="list-style-type: none"> ● Replacement of buck ● Proper timing ● Proper selection of foundation and replacement stock ● Artificial insemination
B. Long kidding interval (days)	246.70	<ul style="list-style-type: none"> ● Long weaning period ● Unavailability of quality breeder buck ● Preference of raising for longer lactation period ● Inherent character of purebred ● Old stock/ unproductive animals ● No breeding plan/ Inappropriate or no weaning practices 	<ul style="list-style-type: none"> ● Breeding plan (schedule and breeds to use) 	

- **Poor kid performance:** Poor kid performance which was due to poor genetic make-up of the animals, poor feeding and nutrition of does and poor health condition of does and kids had eventually affected the performance of the farm. The intervention that could be done is to infuse good genetics through sound breeding plan, culling and selection and yearly buck rotation with in a community to avoid in-breeding. In addition, improvement of feeding and nutrition could also be done through development of pasture, mineral supplementation, flushing and fostering.
- **High mortality:** High mortality was observed in kids less than 3 months old (9.95%) which was caused by exposure to extreme weather condition. This mortality was observed in farms with poor housing facilities, so that provision of proper housing should be one of the priorities.

- **Poor dam performance:** Poor dam performance was caused by low kidding index and long kidding interval. Some commercial farms practiced controlled breeding so that kidding is scheduled in a certain month of the year to suit their convenience. This results to long kidding interval thereby lowering the kidding index and lengthening the weaning period. Sometimes this is done intentionally to lengthen the lactation period when the farm in engage in milk production. Controlled breeding is also done to allow kids to suckle more milk to improve weaning weight. In such a case, there is a compromise between milk and meat production. Depending on the priority of the farmer, a breeding plan and schedule should be in place.

IV. CONCLUSION AND RECOMMENDATION

The three major problems identified in goat raising were poor kid performance, high mortality and poor dam performance. Technological options are already available to address all these concerns to improve farm performance as presented in Table III. It is recommended that farmers be made to understand the potential of goat raising and be able to picture out the real performance of his farm and choose the option/s he is capable of instituting of.

The program, National Goat Farm Performance of the Philippines (NGFPP) aims to transform goat industry by utilizing the information gathered in both types of raisers in the country as the bases of identifying problems; technology gaps and recommends alternative options in their respective farms. There are several reasons cited for low kid performance, namely; poor genetic makeup of the animals, poor feeding and nutrition of the does, and poor health condition of the does and kids. The technological options to improve genetic make-up of the kids being recommended are infusion of good genetics through upgrading using 50% to 75% Anglo-nubian to native does and appropriate breeding management. In addition, improvement in feeding and nutrition and health management are recommended to improve the does and kids health status. Several specific management practices (Table III) are recommended to approach the problem.

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