IMPLICATION OF ANIMAL WELFARE ON THE PRODUCTIVITY AND PROFITABILITY OF LIVESTOCK FARMING

The Case of Backyard Goat Production in the Philippines

A DISSERTATION SUBMITTED TO THE GRADUATE SCHOOL
OF BIOAGRICULTURAL SCIENCES
NAGOYA UNIVERSITY

in partial fulfillment of the requirements
for the degree of

DOCTOR OF AGRICULTURAL SCIENCES

by

ALCEDO Mary Jane Backeng

LABORATORY OF PROJECT DEVELOPMENT
DIVISION OF INTERNATIONAL COOPERATION IN AGRICULTURAL SCIENCES
DEPARTMENT OF BIOENGINEERING SCIENCES
GRADUATE SCHOOL OF BIOAGRICULTURAL SCIENCES
NAGOYA UNIVERSITY
NAGOYA CITY, AICHI PREFECTURE, JAPAN

MARCH 2015

TABLE OF CONTENTS

LIST OF TABLES iv

LIST OF FIGURES v

LIST OF ABBREVIATIONS vi

SUMMARY vii

CHAPTER 1 GENERAL INTRODUCTION

1.1 .The Philippine livestock industry 1

1.2. The scientific concept and definition of Animal Welfare 4

1.3. Animal welfare issues in the Philippine livestock production system 7

1.4. Animal Welfare and the Philippine development goals 7

1.5. Significance of the study 8

1.6. Objectives of the study 9

1.7. Research methodology 9

1.7.1. Farm animal considered in the study 10

1.7.2. Data gathering and method of data analysis 11

1.8. Outline of the dissertation 12

CHAPTER 2 CREATING ANIMAL WELFARE ASSESSMENT METHOD FOR BACKYARD GOAT PRODUCTION IN THE PHILIPPINES

2.1. Introduction 16

2.2. Stockmanship competence as proxy indicator in animal welfare 19

2.3. Principles underlying the assessment method 20

2.4. Methodology 21

2.4.1. Goat stockmanship parameters and indicators used 21

2.4.2. Validation of stockmanship competence parameter 24

2.5. Results and Discussion 25

2.5.1. Scoring of stockmanship competence indicators 25

2.5.2. Method of computing stockmanship competence index score 25
2.6. Conclusion 26

CHAPTER 3 STOCKMANHSIP COMPETENCE AND ITS RELATION TO PRODUCTIVITY AND PROFITABILITY

3.1. Introduction 32
3.2. Methodology 34
3.2.1. Data gathering 34
3.2.2. Data analysis 35
3.3. Results 36
3.3.1 Stockmanship competence index score before and after undergoing FLS-IGM 36
3.3.2. Goat productivity and farmers' income in before and after FLS-IGM 36
3.3.3. Diseases/symptoms observed by farmers on their goat 37
3.3.4. Factors influencing mature weight and mortality rate 37
3.3.5. Correlation between stockmanship competence, goat productivity and profitability 38
3.4. Discussion 39
3.5. Conclusion 43

CHAPTER 4 IMPROVING STOCKMANSHIP COMPETENCE THROUGH CAPACITY DEVELOPMENT

4.1. Introduction 50
4.2. Methodology 52
4.2.1. Data collection 52
4.2.2. Data analysis 53
4.3. Results and Discussion 53
4.4. Conclusion 57

CHAPTER 5 A CASE STUDY ON FARMERS' PRODUCTION PRACTICES AND ITS RELEVANCE TO ANIMAL WELFARE

5.1. Introduction 64

5.2. Methodology 65

5.3. Results and Discussion 67

5.3.1. Production practices associated to gastro-intestinal parasites 67

5.3.2. Egg count per gram of gastro-intestinal parasite 69

5.3.3. Level of infestation 70

5.3.4. Production practices influencing egg count per gram of parasite 71

5.4. Conclusion 71

CHAPTER 5 GENERAL CONCLUSION 77

REFERENCES 81

ACKNOWLEDGEMENT 91

APPENDICES 93

LIST OF TABLES

Table 2-1 Indicators and score for housing competence 28

Table 2-2 Indicators and score for feeding competence 29

Table 2-3 Indicators and score for breeding competence 30

Table 2-4 Indicators and score for health and husbandry competence 31

Table 3-1 Stockmanship competence index score of farmers before and after undergoing FLS-IGM 45

Table 3-2 Productivity and income difference before and after FLS-IGM 46

Table 3-3 Diseases/symptoms observed by farmers on their goat 47

Table 3-4 Factors influencing goat mature weight and mortality rate 48

Table 3-5 Correlation of SCIS, goat productivity and profitability 49

Table 4-1 Result of pre-test and post-test score by farmer's motivation 59

Table 4-2 Factors attributable to post-test score of farmers 60

Table 4-3 Correlation between knowledge and farmer's perceived behavioral change 61

Table 5-1 Difference on production and management practices of farmers with and without training 73

Table 5-2 Level of ST parasite infestation in goats from farmers with and without training 74

Table 5-3 Production practices significantly influencing the EPG of Strongyle Type parasite 75

LIST OF FIGURES

Figure 1-1 Livestock inventory by farm type in the Philippines 2010-2013 13

Figure 1-2 Trend of livestock inventory in the Philippines 2000-2013 14

Figure 1-3 Research survey area 15

Figure 4-1 Motivation of farmers in attending FLS-IGM 62

Figure 4-2 Categorized perceived behavioral change of farmers on their PMP after attending FLS-IGM 63

Figure 5-1 Difference of EPG of ST parasites from goats of farmers with and without training 76

LIST OF ABBREVIATIONS

ANI	Animal Need Index
AW	Animal Welfare
BAS	Bureau of Agricultural Statistics
BC	Behavioral Change
CD	Capacity Development
CLSU	Central Luzon State University
DA RFU I	Department of Agriculture Regional Field Unit I
DEFRA	Department for Environment, Food and Rural Affairs
EPG	Egg Count Per Gram
FAO	Food and Agriculture
FAWC	Farm Animal Welfare Council
FLS-IGM	Farmer Livestock School on Integrated Goat Production
KE	Knowledge Economy
NAHWOA	Network for Animal Health and Welfare in Organic Agriculture
NGOs	Non Government Organization
NSCB	National Statistical Coordination Board
GIP	Gastointestinal Parasite
IFAD	International Fund for Agricultural Development
LDC	Livestock Development Council
LGU	Local Government Unit
PAWS	Philippine Animal Welfare Society
PCARRD	Philippine Council for Agriculture Forestry, Natural Resources Research and Development
PMP	Production and Management Practices
SC	Stockmanship Competence
SCIS	Stockmanship Competence Index Score
SPSS	Statistical Package for Social Science
ST	Strongyle Type
TGI	Tiergerechtheits Index
UNDP	United Nation Development Program
WB	World Bank

SUMMARY

Livestock production is an important sector of the overall agricultural economy in the Philippines. Beyond their direct role in generating food and income, livestock are considered as valuable asset, serving as a store of wealth, collateral for credit and an essential safety net during times of crisis. Through the years, the demand of meat and meat by-products has significantly increased, transforming the livestock industry into a market driven enterprise. In order to narrow the gap between supply and demand, transition in the livestock production system had taken place and, along with this transition, is the rise of animal welfare issues from the production stage until the animal is slaughtered. Discussions about animal welfare have increased over the years, accentuating its profound implications not only on the animal itself, but on poverty alleviation, food safety, sporadic and zoonotic diseases and the like.

Reviewing past studies related to animal welfare, one would find its scientific study relatively young but well established as a scientific discipline [Millman et al., 2004]. Its scientific origin dates back in 1960s when knowledge about animal biological functioning increased greatly and are now used as baseline in considering animal welfare as a science. It was also in 1964 when Ruth Harrison's book "Animal Machine" was published where he emphasized that production animals were often treated like inanimate machines rather than living animals. Many more investigation and research have been done which led into an understanding that animal welfare is a multifaceted issue encompassing important scientific, ethical, economic and political dimensions [Lund et al., 2006]. This means that it needs combination of researches from different disciplines, both from natural and social sciences to understand further its implications to animals and humans.

With its multifaceted dimension, the diversity of what researchers consider to be indicators essential to certain aspects of animal welfare had led to its varied definitions. This means that there is no universal definition of animal welfare yet; however, there is a common understanding that animal welfare is in itself about the animal physiological and biological functioning. As for Rushen (2011), he defines animal welfare as the process and steps taken to prevent unnecessary animal suffering and ensure good quality of life for the animal. The good quality of life that Rushen emphasizes was related to the animal`s experience of hunger, discomfort, injury, pain and diseases and expressing normal behavior. These are all synonymous with the five animal freedoms of the Department for Environment, Food and Rural Affairs (DEFRA), United Kingdom. Deprivation on these five freedoms could disrupt the normal physiological functioning of the animals and could affect livestock productivity and quality of meat, suggesting that animal welfare is essential in the over-all livestock production system. This also means that, although there are varied benefits derived from livestock production, the socio-economic contribution of livestock to humans in terms of productivity and food safety is dependent on the welfare state of the animal.

In the Philippines, livestock is an important commodity for a viable livelihood assistance program to rural household families, but the discussion about animal welfare is still new. It was only in 1998 that the Republic Act Number 8485, otherwise known as the Animal Welfare Act of 1998, was passed to protect and promote the welfare of all animals by supervising and regulating the establishment and operations of all facilities utilized for breeding, maintaining, keeping, treating or training of all animals as objects of trade or as household pets. The government have

also started formulating animal welfare development programs however, assessment method for both pets and production animals has not yet been established. This implies that there is no means of benchmarking, comparison and project monitoring as far as animal welfare is concerned. And while there had been past assessment methods conducted in developed countries, suitability or adaptability of these assessment methods in backyard livestock operation in developing countries is still in question. In addition, the process is often time consuming, costly, and variable depending on the animal and environment. This could be impractical for use as routine on-farm welfare assessment (Scott et. al, 2001; Horning, 2011). Another concern is that hardly any research on animal welfare were done in backyard operation. Evidence based on scientific research is therefore needed to further understand the implication of animal welfare in the over-all road-map towards a sustainable and profitable livestock industry.

The objective then of this research is to examine the implication of animal welfare on the productivity and profitability of backyard livestock farming by investigating capacity development project aimed at improving the livestock industry in the Philippines. The farm animal considered in the study was goat because almost 100% are backyard operated (BAS, 2012). Even though goat raising is considered viable and profitable enterprise, its total production and value have been one of the lowest in the livestock sector (CLSU, 2013). It is therefore essential to investigate how to improve its productivity. The study was conducted in the Philippines, mainly in Region I which is located at the northern coast of Luzon island and is the second top producing region of goat in the Philippines in 2012. The thesis is composed of six (6) Chapters which present evidences on the implication of animal welfare in the

productivity and profitability of backyard livestock farming and implication of capacity development towards animal welfare.

The first Chapter is the General Introduction which provides general information of the Philippine livestock industry, with particular focus on animal welfare and welfare issues besetting the Philippine livestock industry. It likewise includes the significance of the study, objectives and research methodology. Chapter 2 is aimed at conceptualizing a method to assess animal welfare specifically intended for backyard goat production. In this method, stockmanship was used as a proxy indicator to reflect animal welfare. Stockmanship was chosen to represent animal welfare because it is the most important building block of animal health and welfare in any livestock production system. It is the knowledgeable and skillful handling of livestock and is the comprehensive and holistic approach to livestock handling. These brought the author to assess animal welfare using the stockmanship competence (SC) of farmers. SC is defined in the study as the capacity of the stockperson to ensure the welfare of his animal by providing his animal`s needs in terms housing, feeding, breeding and health and husbandry. In other words, SC is comprised of parameters pertaining to housing, feeding, breeding, health and husbandry. These parameters were based on the Philippine Recommends on Goat Production and literature reviews. Parameters were validated by visiting and interviewing 15 backyard goat raisers. Based on the researcher’s own judgment, parameters are adaptable because farmers are currently practicing it. Verification of answers was also possible because housing of goats were just located near the farmer`s house. The average time to finish the entire questionnaire was 1 hour, 22minutes, which implies that it does not require too much time for both researcher and farmers.

Scoring of answers was based on the degree of satisfying the need of the animals with scores from -1 to +2. Stockmanship competence index score (SCIS) was computed as the summation of raw scores divided by the maximum highest score multiplied by 100. For interpreting the scores, mean scores lower than 50% indicates low stockmanship competence and at the same time denotes low animal welfare. On the other hand, mean scores higher than 50% indicates high stockmanship competence, denoting high animal welfare.

Chapter 3 was aimed of identifying the implication of AW on goat productivity and profitability. It likewise aimed of identifying indicators attributable to goat productivity. Using the assessment method discussed in Chapter 2, the second field work was conducted. One hundred-one (101) backyard goat raisers who were able to attend Farmer Livestock School on Integrated Goat Management (FLS-IGM) were interviewed to gather data needed to assess animal welfare using stockmanship competence as the proxy indicator. Result showed that mean stockmanship competence index score (SCIS) of farmers before attended FLS-IGM was 38.53% and 75.81% after FLS-IGM implying a low and high stockmanship competence (SC) of farmers before and after FLS-IGM. Comparing the goat productivity of farmers before and after FLS-IGM, result showed that median mature weight of goat and population of stock in the farm were significantly higher after farmers were able to undergo FLS-IGM. At the same time, median mortality rate was significantly lower. As a consequence of improved productivity, higher economic profit derived by farmers from backyard goat production was achieved. It is evident in this result that stockmanship competence, which reflects animal welfare, is important in attaining high productivity and profitability.

Taking into account that SC is related to goat productivity and profitability, understanding how to improve it is likewise essential. Based on past studies, increased knowledge has played a direct role on human behavioural change. Applying this result in this study, it was hypothesized that increase in knowledge of farmers on the proper production and management practices (PMP) in goat raising will lead to change in stockmanship competence. Chapter 4 then was aimed at identifying factors influencing the increase of farmer's knowledge in goat PMP and verifying the correlation of knowledge and farmer's behavioural change on their goat PMP. A semi structured interview of one hundred-one (101) backyard goat raisers was conducted. Farmers' profile, motivation, farmers' perception on their behavioral change and changes on their actual PMP were gathered. At the same time, a 25-point test was given to farmers to measure individual knowledge gained. The pre-test results were gathered from the Local Givernment Unit (LGU) concerned.

Results revealed that the participants have different motivations for attending the FLS-IGM. Majority (43%) of them were driven to attend FLS-IGM because they wanted to gain knowledge, followed by entrepreneurial motive (16%), improvement of technical skills (14%), benefit from government support (14%), use of spare time wisely (8%) and socialize with co-farmers (5%). There was an increase in knowledge by 129% after FLS-IGM and factors attributable to the increase were years of education, number of organizational meetings attended per year, over-all course perceived as highly satisfactory and participatory and number of training/seminars on goat production attended before FLS-IGM. Although knowledge was correlated to perceived behavioural change, respondents with the motivation of considering goat raising as a business (entrepreneurial motive) has the highest increase in knowledge

(143%) and the highest (very much) perceived behavioural change that is reflected in their actual production and management practices. With the importance of farmers' motivation, it is suggested that agricultural extensionist should also boost the entrepreneurial motivation of the participants for better training outcome.

Chapter 5 presents a case study on the implication of farmers' knowledge on PMP related to gastro-intestinal parasites (GIP) in goat. This chapter was aimed at identifying production practices of farmers significantly related to the prevalence of gastro-intestinal parasites. Fecal samples were collected from 95 goats of farmers with training and from 44 goats of farmers without training. Independent sample T-test making use of the Statistical Package for the Social Sciences (SPSS) program was carried out to determine if there were differences in production practices of goat raisers and egg count per gram (EPG) of parasites in goats from both groups. Regression analysis was carried out to determine the production practices associated with the EPG. Results showed that there were differences and similarities in the production practices associated to the prevalence of parasite of farmers with and without training. Similarities were found in deworming and wilting of newly cut forages before feeding to goats. On the other hand, differences were found in the provision of goat housing, time of grazing, practice of complete stall feeding during rainy season, grazing goats in common pasture area and the provision of feeds and minerals. Fecal test showed that Strongyle Type (ST) was the most common GIP found in the fecal samples of goats collected. Both groups have significant differences in the EPG and level of infestation of ST parasite. Provision of housing, complete stall feeding during rainy season, grazing goats in a common pasture area

and provision of feeds and minerals were the production practices identified to have high significant influence on the EPG of ST worms.

Lastly, Chapter 6 gives the general conlcusion on the implication of animal welfare on the productivity and profitability of backyard livestock farming. In this study, stockmanship competence was identified as a proxy indicator in assessing animal welfare. Result showed that high stockmanship competence has resulted to high productivity in terms of mature weight, mortality rate and population of stock in the farm. Likewise, fewer diseases/symptoms were observed by farmers on their goat. These had lead to higher profitability derived by farmers on backyard goat production. Recognizing the importance of stockmanship competence on the productivity and profitability of livestock, increased knowledge and entrepreneurial motivation are important in improving SC. In addition, farmers equipped with knowledge on the PMP significantly related to the prevalence of GIP in goat resulted to fewer GIP. It is then concluded that animal welfare can be assessed using stockmanship competence and it was evident that capacity development of goat riasers through training on the proper goat PMP have improved goat welfare.

CHAPTER 1

GENERAL INTRODUCTION

1.1. The Philippine livestock industry

The Philippine livestock industry, though it is dominantly backyard operated, is an important sector of the overall agricultural economy. As shown in Figure 1-1, the small and large ruminant industry are almost 100% backyard operated as compared to swine where more than one fourth (28.78%) of the inventory are commercial. Beyond their direct role in generating food and income particularly in the rural area, livestock are considered as valuable asset, serving as a store of wealth, collateral for credit and an essential safety net during times of crisis. In the past decades, significant developments in the livestock production system have taken place making it as one of the fastest growing sector of the agricultural economy. Based on the data of the Bureau of Agricultural Statistics (BAS), Philippines, the trend of livestock inventory had steadily been increasing (Figure 1-2) and the increase could be associated to the change in the over-all livestock production system brought about by the application of modern management practices. It is expected to increase more in the years to come because demands for meat and dairy products are at the same time increasing. This result is due to the growing population and income which strengthens the purchasing power of consumers. Thus, the supply-demand trend makes it a goal for the Philippine government to narrow the gap between production and per capita consumption of food commodities from animal origin. The government likewise intends to address issues pertaining to accessibility, availability, affordability, safety and quality of livestock and livestock by-products in the market.

Looking into the Philippine livestock production system, production and management practice vary in farm types and this is due to some limiting factors such as technical expertise or knowledge, land area, financial and agricultural resources among others. These limiting factors and variations in production system can be clearly seen between commercial and backyard farms where commercial farms tend to be more equipped with the limiting factors mentioned above. In these two production systems, it can be argued that these systems of production have in some way fashioned the quality of relationship between the stockman and animal which could in effect have positive or negative bearing on the status of animal welfare in the Philippines.

In backyard livestock operation, livestock is interwoven with crop production. Majority of farmers still depend upon livestock to carry out agricultural operations in crop production and transport. Ruminant animals are being pastured or fed through cut-and-carry most especially during the rainy season. Farm animals are also fed with rice straws that are available after harvest of rice and indigenous grasses and from other farm by-products (B. Perez, 2010). Crop residues and any other feed stuff the farmerscan find in their farm are used as feed supplement. Since backyard livestock producers have an average of one carabao, two cattle, four goat and five hog (DA, 2007), housing for their animals, especially ruminant animals, are typically made from bamboo and cogon or animal is tied under a tree or post beside the farmer's house. Breeding is often times not being recorded and monitored due to practices that make breeding difficult to monitor such as free grazing in a common pasture area and separation of mature male animals are not often practiced. Swine, on the other hand, is often times provided with a separate housing and fed with commercial feeds mixed

with chopped and cooked agricultural byproducts. In some cases where a farmer has capital, hog are fed with pure commercial feeds.

Considering the role of livestock in the lives of people in the rural area, it is believed that livestock production is one of the major farm activities that could be taken into consideration as one of the strategic solutions to address issues pertaining to food security, environmental sustainability and employment in the rural area. Politicians, media, government officials and social entrepreneurs are also emphasizing the bright future of backyard livestock production and how it could play a major role in achieving the Philippine Millennium Development Goals. However; though its contribution in the economy had increased, low productivity in backyard livestock production is still generally observed. Research and development have been paving the way of improving farm animal productivity through genetic engineering, nutrition, housing, forgae development and health; however, the market is facing a rapid changing patters. An example of which is that consumers preference and market standards are shifting (FAO, 2009) to a more quality and safe livestock products than ever before. More and more reported cases of animal diseases are transmitted to humans and cases of infectious diseases caused by E. coli in which the main source of human infection is contamination of meat by animal feces or infected with Salmonella from poultry and egg (WSPA, 2007). It is argued that the chance of humans being infected with these diseases boils down on how the animals are being managed, that a positive treatment on animals would somehow be beneficial to human health. The increase of zoonotic diseases have led to a broader understanding on how animal welfare can be so important in the road map to sustainable development in general.

1.2. Scientific concept and definition of Animal Welfare

The scientific study of animal welfare is a relatively young but well established scientific discipline (Millman et al., 2004). Its scientific origin dates back in 1960s when knowledge about animal biological functioning increased greatly. It was also in 1964 when Harrison's book "Animal Machine" was published and pointed that production animals were often treated like inanimate machines rather than a living individuals. As such, the British government set up the Brambell Committee to investigate and report on the matter (Broom, 2011). It was emphasized in the report by Thorpe in 1965, one of the members of the Brambell Committee, that an understanding of the biology and animal's needs with biological basis is important, and that animals would have problems if needs are not met. The result of Brambell Report has been the basis for the "Five Freedoms" which are used as the common ground of defining and assessing animal welfare. The five freedoms are freedom from hunger and thirst, which pertains to the ready access to fresh water and a diet to maintain full health and vigor; freedom from discomfort by providing an appropriate environment, including shelter and a comfortable resting area; freedom from pain, injury or disease which deals with the prevention or rapid diagnosis and treatment of animal diseases; freedom to express normal behavior by providing sufficient space, proper facilities and company of the animal's own kind; freedom from fear and distress by ensuring conditions and treatment, which avoid mental suffering.

Through the years, there had been considerable wealth of knowledge regarding animal welfare. There had been a dramatic increase of scientific studies on the implication of animal housing and husbandry to animal welfare. Miele et al., 2013 mentioned that the effects of housing and husbandry conditions which were

addressed frequently, adopt an epidemiological approach that involves examination of animal physiology, behavior, health and production. Likewise, disciplines in the area of behavioural and physiological sciences had been studied. Findings of past studies reveal that the way the animals respond to stressful stimulation is a key area, with clear and important consequences for productivity, product quality and profitability (Miele et al., 2013).

1.2.1. Definition of Animal Welfare

The term animal welfare was used in 1970 and early 80 specifically in western countries but there was no common and clear definition of the term. It is a term that can mean different thing to different people most especially in the past where animal welfare was seen chiefly in terms of body and physical condition. As research progressed, it was found out that welfare of animals cannot be defined by focusing only on physiological measures such as endorphins, plasma cortisol and animal heart rate but it is more on the fundamental behavioral needs of the animal that should be allowed to satisfy (Hewson, 2003). Likewise, although the Brambell Committee had submitted their report of their investigation, a definition of animal welfare was not included. Based on some generally accepted views of the physiological functioning of the animal, it was proposed that animal welfare means the animal was in harmony with nature or its environment. However, this definition was not fully accepted and used because being in harmony is a single state so it does not allow scientific measurement (Broom, 2011). More definition on animal welfare have been proposed by various researchers and each definitions reflect their different backgrounds and disciplines such as Broom, 1988 where he defined animal welfare as the animal's

ability to cope and adopt with its environment. However, it should be understood also that there is a limit to adaptation such that animals may fail to adopt with extreme temperature, pathogen multiplication, unavailability of food or difficult social conditions because it is already outside the tolerable range (Broom, 2011). The American Veterinary Medical Association on the other hand believed that the animal is in a good state of welfare if (as indicated by scientific evidence) it is healthy, comfortable, well nourished, safe, able to express innate behavior, and if it is not suffering from unpleasant states such as pain, fear, and distress. Duncan (1993) and Dawkins (1990) defined animal welfare based on animal's feelings and emotions; and Blood et al., 2007 defined it as the avoidance of abuse and exploitation of animals by humans by maintaining appropriate standards of accommodation, feeding and general care, the prevention and treatment of disease, and the assurance of freedom from harassment, and unnecessary discomfort and pain.

With the diversity of what parameters describe animal welfare, there is so far no standard and precise scientific definition of animal welfare; however, there is general agreement within the scientific community about the broad terms of what represents good animal welfare (Blokhuis et al., 2013). This consensus had been synthesized and expressed in the "Five Freedoms" of the UK's Farm Animal Welfare Council (FAWC, 1992) mentioned above. In this case, it could be argued that these five freedoms could be used to assess the status of animal welfare in relation to animal's productivity and behaviour. The welfare can then be measured scientifically and results could range from very good to very poor welfare based on the scientific understanding of what defines animal welfare.

1.3. Animal Welfare issues in the Philippine livestock production system

Animal welfare is still new in the Philippines. It is only in 1998 that the Republic Act Number 8485, otherwise known as the Animal Welfare Act of 1998, was passed to protect and promote the welfare of all animals by supervising and regulating the establishment and operations of all facilities utilized for breeding, maintaining, keeping, treating or training of all animals as objects of trade or as household pets. Currently, there exists some organizations that promote welfare education, e.g. Philippine Animal Welfare Society (PAWS) and Philippine Society for the Prevention of Cruelty to Animals (PSPCA), but their concerns are more on companion animals and do not have a mass base (Matias, J, 2014). Government agencies have also started to raise awareness and understanding on animal welfare, however, hardly any research have been done yet on animal welfare for both pets and production animals hence, there is no way of benchmarking, comparison and project monitoring. Although the term Animal Welfare is being used in livestock policy and project developments, there is still meager information or method on how to characterize status of animal welfare of farm animals and how it is affecting current livestock productivity. Thus, there is no basis as to what production system should be improved. Continues research pertaining to animal welfare is deemed necessary in order to come up with a clear-cut policy and programs from different stakeholders involved.

1.4. Animal Welfare and the Philippine Development Goals

One of the major lead agencies in the Philippines responsible in boosting farmers' income and reducing poverty incidence in the rural area is the Department of

Agriculture. Fighting poverty has become the dominant priority for many decades which resulted in the formulation of the Millennium Development Goals (MDGs). The analysis of both positive and negative interrelations between livestock production and the MDGs is the central element in defining processes to achieve the MDGs and the inclusion of livestock in the livelihood programs can help to alleviate poverty and promote sustainable development (LivestockNet, 2006).

The top most priority in the MDG is the eradication of extreme poverty and hunger where in livestock production plays a major role in achieving this goal. For many landless people, livestock are the only productive asset farmers have next to their labor. It's their living "cash card" in case of emergencies and needs (Alo, 2006) and likewise reduces their economic vulnerability (Villar, 2004). With the increasing demand for livestock products and the development of livestock production system, livestock production will certainly contribute to food security and the creation of income generating activities where smallholder farmers can certainly play a role on this. However, issues mentioned above should be taken into consideration for farmers to be able to fully reap the benefit from livestock production.

1.5. Significance of the study

This study will make a considerable contribution in understanding the current animal welfare in backyard livestock operation in the Philippines. It likewise present an assessment method that could be utilized in measuring animal welfare particularly in backyard goat production. The study combines range of data that provide relevant information on potential welfare problems so that, like other assessment methods, it can serve as decision support system to farmers, policy makers and project

development implementers. Unlike other welfare assessments where it focuses on single aspect of management practice, the study includes comprehensive data on production and management practices of farmers from housing to feeding, breeding and health and husbandry. Productivity in terms of mortality and mature weight were also reflected in the study in order to exemplify the implication of animal welfare in backyard livestock farming that could be an important information for policy makers, educators, researchers and livestock extensionist. Evidence-based information is needed to improve or back-up future livestock development projects.

1.6. Objectives of the study

The objective of the study was to identify the implication of animal welfare on the productivity and profitability of livestock farming and verify the implication of capacity development of farmers on animal welfare in the Philippines.

1.7. Research Methodology

The study was conducted in the Philippines which is located in the Southeastern Asia and is an archipelago comprising of 7,107 islands clustered into three major islands - Luzon, Visayas and Mindanao. The total land area of the Philippines is 300,000 km^2 where in agricultural land area covers 9.671 million hectares divided into arable land (4.936 million hectares), permanent cropland (4.225 million hectares), permanent pasture land (.129 million hectares), forest land (.074 million hectares) and others comprising of .307 million hectares (World Bank, 2006). The population had been increasing from 85, 261,000 in 2005 to 92,337,852 in 2010 [NSCB, 2010] where about half (51.00%) lives in rural area and agriculture as the

main source of income (IFAD, 2014). Its climate is tropical marine and is dominated by a rainy season and a dry season. The northeast monsoon is from October to February where it brings cold wilds from the north, March to May is summer and June to September is generally the month of rain. The country's average temperature ranges from 25 degrees Celsius to 32 degrees Celsius with humidity around 77%. Typhoon, earthquakes, volcanic activities, tsunami are among the major natural hazards in the Philippines (WWCI, 2012).

1.7.1. Farm animal considered in the study

In order to achieve the objective, farm animal commodity was chosen. In this study, goat was chosen as the farm commodity to elucidate the implication of animal welfare in animal productivity and profitability. Goat was chosen because it is backyard dominated (98%) and had undeniably played a vital role in the rural economy in the Philippines. Throughout the region, goats are very important in the protein diets of the people, as well as a good, stable source of livelihood especially for the poor in the rural areas. Goat production is mostly carried out by smallholders where the animals are kept in small flocks at an average of five head/family. While goat production remains at a subsistence level, its contribution to the total farm income is substantial. Goat production fits well in the rural landscape as well as in the resource capacity of smallholder farmers. It requires low initial capital and guarantees a high return on investment in as fast as two years based on the cost and return analysis of goat production. Hence, it can be argued that goat production can be an attractive undertaking among rural households. However, its total production and value have been one of the lowest in the livestock sector (CLSU, 2013). This means

that more effort is yet to be done to identify issues that need to be addressed to achieve its maximum potential.

1.7.2. Data gathering and method of data analysis

Since goat was chosen for the study, Region I, which is located at the northern coat Luzon Island, was the selected as the study area because it is considered as the second top producing region of goat in the Philippine (Figure 1-3). Data gathering was conducted in Region I in coordination with the Local Government Unit (LGUs). Before going to the field, survey questionnaire was prepared to gather pertinent data needed to answer the objective. Survey questionnaire is a very popular data gathering instrument that is utilized to collect, analyze and interpret the views of a group of target people. This instrument is commonly used in various fields of research, such as sociology, marketing research, politics and psychology. The approach that was adapted to gather data based on the questionnaire was semi-structured interview to encourage free and open responses from target interviewees. A semi-structured interview is a very simple, efficient and practical way of getting data which is consistent with participatory and emancipator models. Interpersonal skills such as the ability to establish rapport, combining with humor and humility, are important when gathering data using interview (Newton, N, 2010).

After qualitative and quantitative data needed were gathered from the interview, all data were consolidated. It was then analyzed, and interpreted using different methods of data analysis using Statistical Package for Social Science (SPSS). Qualitative data were consolidated and interpreted following the format of the questionnaire. Quantitative data were analyzed wherein descriptive statistical tools

such as percentage, mean and median were used. Test in the homogeneity of variance was performed. Anova was carried out to compare the mean and determine if there is a significant difference. Regression analysis was carried out to determine the factors that influence a certain outcome and correlation was carried to check the correlation of variables identified. All data that were gathered from all chapters were analyzed using SPSS.

1.8. Outline of the dissertation

This dissertation is composed of a six (6) Chapters. The first Chapter is the General Introduction which provides general information of the Philippine livestock industry, with particular focus on animal welfare and welfare issues besetting the Philippines livestock industry. It likewise include the significance of the study, objectives and research methodology. Chapter 2 presents a comprehensive animal welfare assessment method for backyard goat production in the Philippines using stockmanship competence as proxy indicator. Chapter 3 verifies the implication of stockmanship competence on livestock productivity and profitability making use of the assessment method in Chapter 2. Chapter 4 addresses how to improve stockmanship competence focusing on increasing farmer's knowledge and factors attributable to the increase in knowledge. Chapter 5 presents a case study that demonstrates the implication of farmer's knowledge on production practices related to gastrointestinal parasites and lastly, Chapter 6 summarizes the findings on the implication of animal welfare on the productivity and profitability of backyard goat production and implication of capacity development of farmers through training on animal welfare.

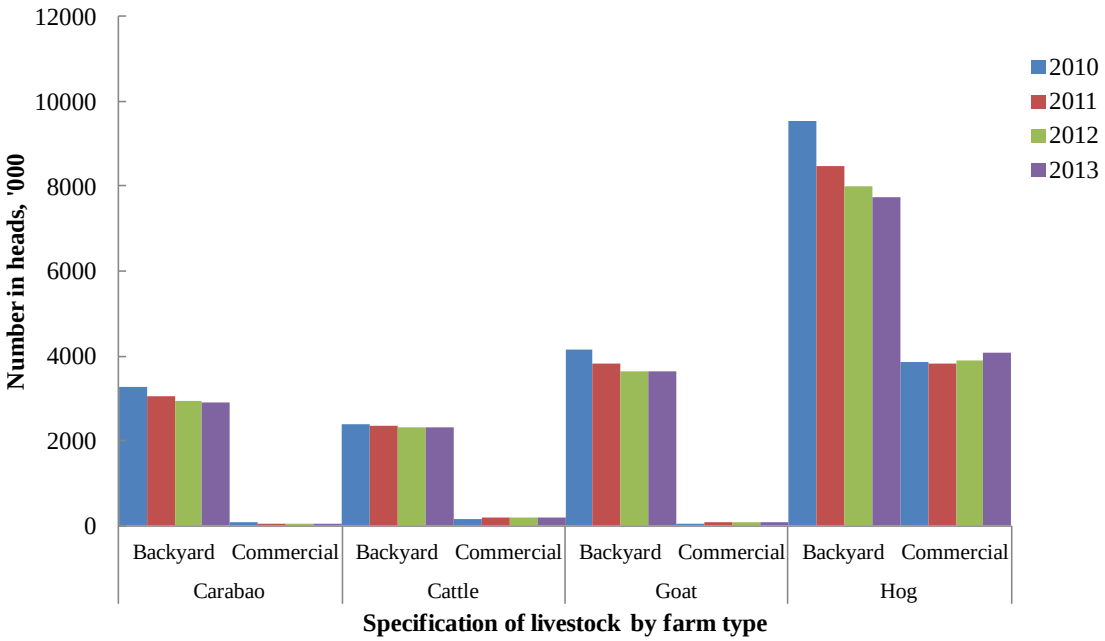


Figure 1-1 Livestock inventory by farm type in the Philippines 2010-2013

Source: BAS, Philippines

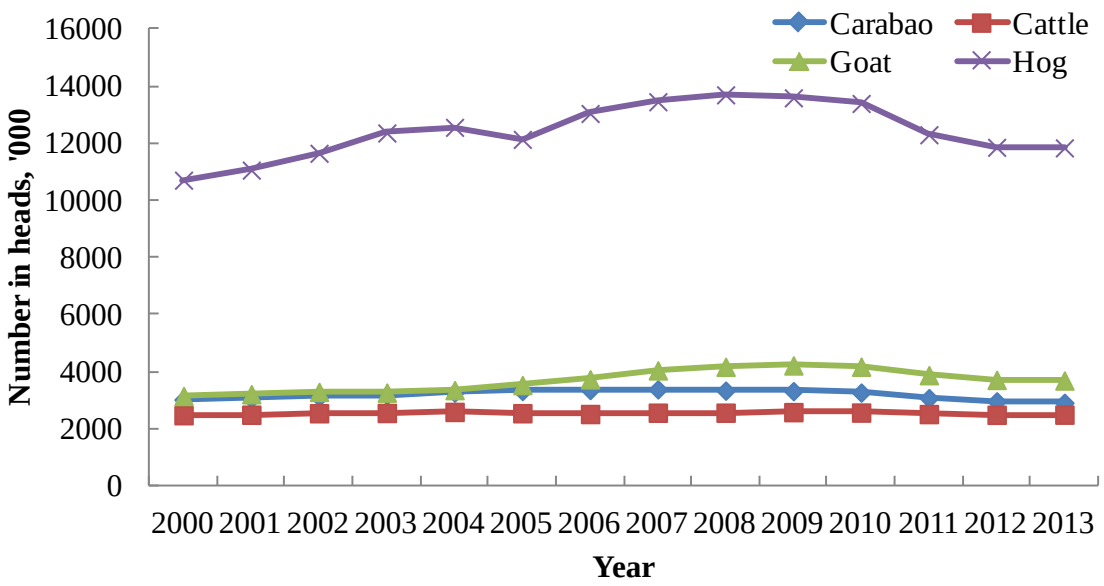


Figure 1-2 Trend of livestock inventory in the Philippines 2000-2013

Source: BAS data, Philippines

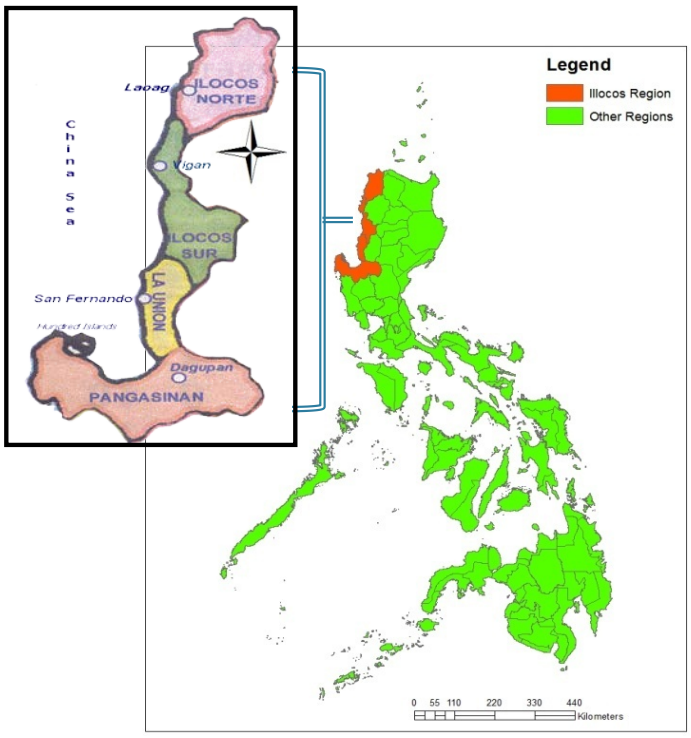


Figure 1-3 Research survey area

Note: Map of Region I was sourced out from Department of Agriculture Report, 2002. Map of Philippines was sourced out from www.freemap/asia/philippines (accessed on January 10, 2014

CHAPTER 2

CREATING ANIMAL WELFARE ASSESSMENT METHOD FOR BACKYARD GOAT PRODUCTION IN THE PHILIPPINES

2.1. Introduction

In order to understand the implication of animal welfare, it is essential to quantify first the status of animal welfare. Quantifying or assessing it is an important global issue in the livestock industry. This is because result of assessment can give vital information as to what system of livestock production is practiced and can serve as a benchmark in creating a sound policies and development projects in meeting livestock development goals. Lack of appropriate methods in gathering information on animal welfare status could be a hindrance for policymakers and development planners in taking appropriate actions or addressing issues besetting the livestock industry. Over the years, different ways of assessing animal welfare have been conceptualized, taking into account animal-based measures such as the physiological and biological processes that occur in animals when a certain welfare indicator is deprived. Animal welfare is all about the animal itself. Thus, as described by Frazer et al. (1997), one comprehensive approach to animal welfare assessment is measuring the health and productivity, feelings, affective states, and the ability to express animal's natural behaviour. Quantifiable measures of physiological status have been identified such as body temperature, heart rate and levels of cortisol hormone (Sorensen and Sandoe, 2001). These are all science-based approach, however such techniques are often time-consuming, costly and variable depending on animal and

environment. Such method could also be impractical for use as routine on-farm welfare assessment (Scott et al., 2001; Horning, 2001; Organicvet UK, 2007).

Another assessment approach commonly used is the five freedoms which originated in the United Kingdom – freedom from hunger and thirst; freedom from discomfort; freedom from pain, injury and diseases; freedom to express normal behaviour; and freedom from fear and distress. The five freedoms emphasized that there should be a ready access to fresh water and a diet to maintain full health and vigour of the animal; provision of shelter and comfortable restings area; prevention or rapid diagnosis and treatments of diseases; there is sufficient space and facilities so that animals can express normal behaviour; and that conditions and treatment which avoid suffering should be ensured. These indicators are all defined as an ideal state of welfare rather than standards for acceptable welfare state (DEFRA, 2013).

Another method is the animal needs index (ANI) or tiergerechtheitsindex (TGI) developed by Bartussek in 1980s in Austria which takes into account the impact of housing system or condition on animal welfare. A developed and specific version of TGI on-farm is detailed in Bartussek 1999. There were several amendments to the original German version of TGI where not only housing condition was considered, but also selected aspects of the animal's environment and farm management were used in the indexing method. Currently, it is reffered to as the Animal Need Index 35L/2000 which is detailed in Bartussek et al., 2000. Other scientists (De Jonge et al., 2000; Lensink et al., 2001a; Rushen et al., 2010) have emphasised shockmanship as an indicator that affects animal welfare. Likewise, Brown and Seddon (2014) concluded in their study that many of the concerns related to group housing (e.g., aggression and injury) can be resolved with good system

design and stockmanship. Stockmanship denotes the comprehensive and holistic approach to livestock handling (Hibbard, 2013). It refers to the role and skill of the stockman in relation to the welfare of the animal. Farm Animal Welfare Council (FAWC) and other welfare organizations have reconized the value of stockmanship in ensuring animal welfare. Proceedings during the 3rd NAHWOA Workshop 2000 indicated that the stockperson's ability to understand livestock and to respond to the needs of the domesticated animals are among the most important building blocks of animal health and welfare in any livestock production system. This belief is backed by Park and Singer (2012) in their study stating that animal production practices (by animal owners) influence the welfare and health of animals themselves.

Building on these reviews and considering that animal welfare is the step taken by animal owners to prevent animal suffering or unsatisfactory living conditions (AWR Org, 2012), the current study took the path of highliting stockmanship competence as proxy indicator in assessing animal welfare at the backyard level. Past studies have clearly emphasized the importance of stockmanship in any livestock operation but methods of assessing it in relation to animal welfare is scarce. Although hardly any research dealing with animal welfare at the backyard goat production can be found at present, the rich body of knowledge on goat science could give us an understanding on what parameters to be considered for assessing animal welfare using stockmanship as indicator.

The study aims to create an animal welfare assessment method for backyard livestock production, specifically backyard goat production, considering stockmanship competence as proxy indicator. It is hoped that this study would contribute to the body of knowledge on welfare assessment for backyard goat

production through stockmanship competence and could be used as a logical and comprehensive method for assessing welfare in backyard goat operations.

2.2. Stockmanship competence as proxy indicator for assessing animal welfare

Past scientific studies have always highlighted genetics, environment, nutrition, housing and health related variables in improving farm animals' productivity and welfare. Lately, attention was given on the importance of stockmanship in ensuring animal welfare. It is argued that livestock production involves several interaction between the farmer and animals. This interactions involves tactile and auditory and the welfare of the animal relies on how the animals are being managed by farmers. It is determined in practice by the husbandry and management practices of livestock owners towards their animals. Past researches, particularly in the pig industry (Hemsworth and Coleman, 1998) and dairy cattle (Hanna et al. 2009), have showed that stockperson's attitude can limit the productivity and welfare of livestock. In addition, a Dutch study strongly suggests that the reproductive performance of pigs is associated with the relationship between the stockman and breeding stock (Albright, 1986). The importance of stockperson in ensuring animal welfare is evident. Animals have always been in contact with their owners every day. The stockman or farmer live, work, monitor and communicate with their animals (Wemelsfelder, 2000). They have the responsibility to provide food, water, housing to protect their animals from rain, heat and predators, as well as other forms of support with the expectations that the animals would give back food, milk, power, transportation and companionship. This means that the capacity of the farmer to interact and provide the animal's needs on a daily basis is important for the animal's welfare and productivity. As stated by

Zulkifli (2013) in his review paper, the quality of human-animal interactions can have a profound impact on many facets of animal's physiology and behaviour and this interaction could be neutral, positive or negative in nature. It can be argued, in this case, that the deficiency of farmer's capacity on proper stockmanship could mean deficiency in welfare and vise versa. Likewise, it can be argued that environmental factors where animals are exposed could be determined by the production system the farmers are practicing, thus, humans have the major role in ensuring the welfare of their animals. In these justifications, stockmanship then can be used as an indicator in assessing animal welfare. This can be a practical, logical and inexpensive way of assessing welfare by utilizing and integrating readily available scientific body of knowledge on animal science and production as a baseline for assessment.

2.3. Principles underlying the assessment method

The different methods in measuring animal welfare were conceptualized in developed countries and were implemented mostly in semi-intensive and commercial livestock farms which may not be suitable for assessing backyard livestock operation in developing countries. An example could be the housing design. The size of production animals being raised in developed countries is far way bigger compared to production animals being raised by rural folks in developing countries. In order to come up with an assessment method that can be utilized as a baseline for policy and development projects for the goat industry, local situation should be considered. Assessment that captures local parameters is vital to be able to develop suitable strategies to address local animal welfare issues.

2.4. Methodology

2.4.1. Goat stockmanship parameters and indicators used

In order to be guided on what welfare indicators were needed for evaluating sctockmanship, a definition is essential. Stockmanship is defined in this study as the capacity of the stockman to provide the needs of their animals for their growth and reproduction through proper production and management. The Philippine recommendation on goat production (PCCARD, 2005), tips on goat raising (LDC, 2012) and some scientific literature related to goat behavior and production (e.g. Alo et al, 2006; Collar et al, 2000; Smart, 2010) were used as references in creating stockmanship competence assessment indicators. The study has taken into consideration variables that provide relevant information on potential welfare problems so that, like other assessment methods, can serve as decision support system for farmers, policy makers and project development implementers.

In this research, the main parameters were housing, feeding, breeding and health and husbandry management. These parameters were considered because it has always been the major components of livestock development projects in the Philippines. Within each parameter, indicators were identified to sum up or reflect its relevance to animal welfare. Taking for example housing design, indicators that could possibly make up a good goat housing have been identified. Housing should provide protection against rain, heat, wind, cold and should be appropriately designed to give comfort for the animal. Goats are easily affected by temperature, humidity and rain. In hot climates, goats need shelter from intense heat during the day. In humid areas they need protection from prolonged heavy rain. Excessive wetting from rain can cause pneumonia and an increase in parasitic infestation (FAO, 1988). How the

stockperson can provide recommended space requirements, ventilation, cleanliness and other housing facilities were considered in this parameter. Good nutrition likewise, is very important for the growth and development of the animal. Proper nutrition and water supplies in adequate amounts prevent physical and psychological suffering from hunger and thirst. They are also crucial for optimal performance and fitness of animals (FAO, 2012). Studies showed that insufficient nutrition can reduce sheep fertility (Rassu, 2004) and water restriction can cause stress (Ayoub, 1998). Likewise, feeding management plays an important role in enhancing animal welfare. Improper feeding management poses risks for animlas to be suseptible to diseases and gastro-intestinal parasites, thus compromizing their welfare. There is a large body of literature already highlighting the importance of good animal nutrition and feeding management in ruminant animals eg. Hutchings et al., 2000 and Sevi et al., 1999a. In assessing this indicator, this study taken into account the capacity of a stockperson to provide food or nutrient requirements for animals, practice proper nutrition and feeding management based on literatures.

Goat breeding management encompasses practices of farmers in breeding their goats, which, in most cases, farmers may not be aware of. Proper breeding practices are important as the other parameters in this study. With the right breeding practices, increase in growth rate and productivity and welfare are achieved leading to increased economic profitability. In this study, this indicator includes common breeding practices, age of breeding, selection, buck service per year and other factors affecting animal welfare. Age of breeding, for example, is identified as important. A female goat reaches maturity as early as 4 months but it is recommended that animals should be bred at 8months old so that they are well grown and in better condition as

compared to younger ones. Carrying pregnancy at an early age increases the probability of compromising the health of the animal which may result to weak and small offsprings.

It is important that any injury, illness or distress observed should be treated promptly. It is recommended that sick animals are to be separated from the herd and be given due care. Appropriate preventive treatment should be administered to goats for common diseases or those that are likely to occur in goat herds. Goats are particularly susceptible to gastro-intestinal parasites (DEPI, 2001). Likewise, any husbandry practices are recommended to be performed in a manner where stress and pain are minimized. For operations that can bring much pain to the animal, it should be carried out with anesthesia and should be done by an experienced person or veterinarian. Castration for example is recommended to be carried out in the early month after kidding, preferably before 2 months of age to avoid administering anaesthesia. However, if it is done more than 2 months, the ability of the stockman to minimize stress and pain is important. Health and husbandry management indicators reflect how a stockperson care for the animal when they are weak and sick and how they try to prevent infestation of gastrointestinal parasites which is one of the most common problem in goat production.

Although these indicators and variables (Appendix 1-4) were chosen for this study, it should be understood that these might still be insufficient to reflect good welfare as with other assessment indicators on animal welfare. However, based on scientific literatures, they are considered as pre-requisite for good welfare.

2.4.2. Stockmanship competence parameter validation

Fieldwork was conducted to validate stockmanship competence indicators from September 3-30, 2012 in Region I, northern Philippines. In coordination with the Agricultural Officer and the Livestock Specialist for the municipalities of Bani, Mabini, Alaminos, Pugo and Tagudin, a total of 15 backyard goat raisers (3 raisers per municipality) were randomly visited and interviewed in their farms using the prepared stockmanship questionnaire. The livestock specialists in each area have contacted first the farmers regarding their available time before visiting their farms and conducting the interview. The livestock specialists went along during the field validation. It is very common that the livestock specialists are friends with farmers or known by almost all livestock raisers in the rural area.

This validation was purposely done confirm if indicators used for assessing stockmanship were relevant in the area and whether the questions can be easily understood by farmers so that data gathering or, making use of the questionnaires, need not necessarily be done by an expert in survey or field data gathering. During the field visit, it was observed that most (90%) of the farmers have their goats and goat houses either close to their homes or just in their backyard. This means that validating the answers of goat raisers to the interview questions is possible given that an ocular inspection of their animals and animal housing can be immediately conducted. All the farmers interviewed said that the questions were easy to understand since local dialect was used. The average time for going through the whole set of questionnaire, including some side stories of the farmer, was about an hour and 22 minutes. This implies that the process does not require too much time for both the farmer and researcher.

2.5. Results and Discussion

2.5.1. Scoring of stockmanship competence indicators

The assessment adops indexing method like that of the Animal Needs Index for Cattle by (Bartussek et al. (2000). Index system was used because it is highly practicable and repeatable (Johnsen et al., 2001). Each indicator was given a score from -1 to +2. Scoring was based on how weak or strong it is in satisfying the needs of the animals or impact on animal welfare. Housing and feeding components have the same total maximum score of 26 while breeding and health have 16 and 20, respectively. Though they have different scores, each component is treated with the same weight because there is no research undertaken in identifiyng which component has higher influence on animal welfare. The total minimum and maximum points a respondent could get is -23.5 and + 88 points respectively which means that scores can take any value from -23.5 to + 88 points. The higher the score, the better because it signifies high probability of meeting the animal's needs or welfare.

2.5.2. Method of computing stockmanship competence index score

Housing, feeding, breeding and health assume equal weights as stated above. In this case, the index score per parameter is computed as the summation of raw score divided by the maximum highest score multiplied by 100. Stockmanship Competence Index Score (SCIS) then will be calculated using the following equation:

$$SCIS = \frac{\sum(X_i)}{Y} \quad i=1,\ldots,n$$

Where n is a set of stockmanship parameter; 1 a specific indicators in n; X the

index score of the ith indicators in n (housing, feeding, breeding and health & husbandry) and Y the total number of indicators.

2.6. Conclusion

Assessing animal welfare is a multi-disciplinary approach and needs continuous research and development in order to create a method for integrated welfare assessment. An assessment method need not be costly and time consuming, even if repeated anytime, and should be feasible and reliable in conveying welfare information to different stakeholders as to what kind of management and production environment the animals are exposed to. Such information can give insight and understanding for appropriate decision making.

There are currently different approaches on how to assess animal welfare but were rarely done in backyard livestock operation in developing countries. This study has come up with an assessment method making use of stockmanship as a proxy indicator, having it widely recognized as the most important building block of animal health and welfare in any livestock production system. The study has identified stockmanship parameters based on the recommendation and tips on goat production in the Philippines and scientific literatures based on animal needs making it more relevant and practical for use in local areas. The study can be used to characterize or determine the welfare of goats and the results can be utilized as a benchmark for comparison and project monitoring. Likewise, it adds to the growing body of knowledge on on-farm assessment of animal welfare. Though, like other welfare methods used, the identified indicators in this study may still be insufficient to accurately determine the welfare status of goats, they can still serve as a starting point

or reference for a sound goat welfare practice. Further research is needed to standardize indicators and identify other factors that impact good animal welfare in rural areas.

Table 2-1. Indicators and scores for housing competence

Production and Management Practices	Score
Housing competence (maximum range of scores = 26)	
location of goat house waterlogged during rainy season	very often = -1; often = 0; sometimes = 1; rarely = 1.5; never = 2
flooring design adopted	not elevated from ground and not cemented = -1 not elevated and cemented but provide stair-type elevated platform = .5; not elevated but floor is cemented = 1; elevated with slatted bamboo flooring = 1 not elevated but floor cemented with stair-type bamboo slatted elevated platforms = 2 elevated with slatted bamboo flooring and with stair-type elevated platfors = 2
height from floor to ceiling provided	1.25 meter = 0; 1.5meters = .5; 1.75 meters = 1; 2 meters = 1.5; >2 meters = 2
ceiling used	pure galvanized iron = 1; cogon/nipa = 2
provision of eaves extension	none = 0; .25 meter = 0.5; .5 meter = 1; .75 meter = 1.5; 1 meter = 2
provision of sun and wind breakers at the side of housing	no = 0; yes = 1
floor space provided per adult goat	<.5 meter^2 = 0; .5 meter^2 = 0.5; .75 meter^2 = 1; 1 meter^2 = 1.5; >=1.25 meters^2 = 2
provision of fenced loafing area if yes	no = 0; yes = 2 not cemented = 0; cemented = 1
provision of feeding trough/rack if yes	no = 0; yes = 2 located inside the house = 0; located outside the house = 1
provision of clean water trough	never = -1; rarely = 0; sometimes = .5; often = 1; very often = 2
provision of separate rooms/partitions	no partitions = -1 separate room for kidding area/lactating does only (1 room) = 0.5 separate room for kidding area/lactating does and weaned kids only (2 rooms) = 1 kidding area/lactating does, weaned kids and growers (3 rooms) = 1.5 kidding area/lactating does, weaned kids, growers and buck(4 rooms) = 2
provision of brooder box	no = 0; yes = 1
sanitation	when feces is accumulated = -1; when it starts to accummulate = 0; somestimes = 1; often = 1.5; very often = 2

Table 2-2. Indicators and scores for feeding competence

Production and Management Practices	Score
Feeding competence (maximum range of scores = 26)	
complete confinement during rainy season	never = -1; rarely = 0; sometimes = .5; often = 1; very often = 2
frequency of grazing the animal during dry season	never = -1; rarely = .5; sometimes = .1; often = 1.5; very often = 2
graze the animal early morning when dew still present	very often = -1; often = 0; sometimes = 0.5 rarely = 1; never = 2
pasture the animal in a communal pature area	very often = 0; often = 0.5; sometimes = 1 rarely = 1.5; never = 2
satisfy feed requirement per animal per day (4.5% body weight)	never = -1; rarely = 0.5; sometimes = 1; often = 1.5; very often = 2
provide a mixture of different grass and legumes	never = -1; rarely = 0.5; sometimes = 1; often = 1.5; very often = 2
grow of-season forage crops to avoid feed scarcity in dry season	never = 0; rarely = 0.5; sometimes = 1; often = 1.5; very often = 2
for cut and carry, wilt the forage before feeding to animal	never = -0.5; rarely = 0.5; sometimes = 1; often = 1.5; very often = 2
provide feed supplement to lactating does, bucks	never = 0; rarely = 0.5; sometimes = 1; often = 1.5; very often = 2
provide feed supplement in times of forage scarcity	never = -1; rarely = 0.5; sometimes = 1; often = 1.5; very often = 2
provide mineral & vit. Supplements	never = 0; rarely = 0.5; sometimes = 1; often = 1.5; very often = 2
provide UTRS and or silage	never = 0; rarely = 0.5; sometimes = 1; often = 1.5; very often = 2
provide clean drinking water	never = -1; rarely = 0.5; sometimes = 1; often = 1.5; very often = 2

Table 2-3. Indicators and scores for breeding competence

Production and Management Practices	Score
Breeding competence (maximum range of scores = 16)	
most common breeding practice	A.I = -1; inbreeding = 0.5; upgrading = 2 crossbreeding = 2; purebreeding = 2
age of breeding	<=5 mos = 0; 6 mos. = 0.5; 7 mos. = 1 8 mos. = 1.5; >=9 mos = 2
separate mature male from female	never = 0; rarely = 0.5; sometimes = 1 often = 1.5; very often = 2
practice stock selection	never = 0; rarely = 0.5; sometimes = 1 often = 1.5; very often = 2
purchase breeder from accredited breeding farm	never = 0; rarely = 0.5; sometimes = 1 often = 1.5; very often = 2
use of yearling breeder buck per year	>31services/yr = -1; 30-31 services/yr = 0; 28-29 services/yr = .5; 26-27 services/yr = 1; 24-25services/yr = 1.5; <=23 services/yr = 2
cross small does and big buck	very often = -1; often = 0; sometimes = 0.5 rarely = 1; never = 2
in-heat does introduced to the buck not vis versa	never = 0; rarely = 0.5; sometimes = 1 often = 1.5; very often = 2

Table 2-4. Indicators and scores for health and husbandry competence

Production and Management Practices	Score
Health and husbandry competence (maximum range scores = 20)	
practice strategic deworming	never = -1; rarely = 0.5; sometimes = 1; often = 1.5; very often = 2
attend to animal's need when sick (medicine,food,water, etc)	never = -1; rarely = 0; sometimes = .5; often = 1.5; very often = 2
assist weak does during kidding (dystocia)	never = -1; rarely = 0; sometimes = .5; often = 1.5; very often = 2
separate sick animals	never = -1; rarely = 0; sometimes = .5; often = 1.5; very often = 2
treat wounds/injuries	never = -1; rarely = 0; sometimes = .5; often = 1.5; very often = 2
practice dis-budding	never = -1; rarely = 0; sometimes = .5; often = 1.5; very often = 2
practice hoof-trimming when hoof too long	never = -1; rarely = 0; sometimes = .5; often = 1.5; very often = 2
age of goat when performing castration	more than 10 weeks = 0; 9-10 weeks = 0.5; 7-8 weeks = 1; 5-6 weeks = 1.5; 3-4 weeks = 2
if not expert, seek vet/technician assistance	no = 0; yes = 2
practice disinfection if needed	never = -1; rarely = 0; sometimes = .5; often = 1.5; very often = 2

CHAPTER 3

STOCKMANHSIP COMPETENCE AND ITS RELATION TO PRODUCTIVITY AND PROFITABILITY

3.1. Introduction

Backyard goat production in the Philippines accounts for more than 99% of the animal inventory (BAS, 2010). Goat is a popular farm animal among rural folks because it requires simple management and low-cost production inputs as compared to swine and poultry. Goat subsists on crop residues, agro-industrial by-products or any locally available forage sources. Though this industry is backyard dominated, its contribution to the socio-economic status of rural folks, and the Philippine economy as a whole, was evident in the past years. Previous researches on goats in Asia and Africa (Brown, 1985; FAO, 1990; Sebei et al., 2005) confim goat's potential as an economically viable livestock which makes goat-raising one of the well accepted livelihood assistance projects for poverty alleviation to this moment. However, it should be understood that the socio-economic contribution of goat-keeping could be dependent on how it is managed by its owner. Results of past scientific studies show that the way owners treats their animals can directly affect their health, productivity and welfare (Boivin et al., 1998; Hemsworth and Coleman, 1998; De Jonge et al., 2000) Lensink et al. (in press). In this case, the stockperson has a duty to ensure that the welfare of their animals is taken into utmost consideration (Leaver, 1999).

The term stockmanship is commonly used in developed countries most especially in the dairy and cattle industry. It is defined by the Stockmanship Journal as the knowledge and skillful handling of livestock in a safe, efficient, effective and low-

stress manner. Essentially, it is the art and science of handling animals properly (Fears, 2014). The Farm Animal Welfare Council on the other hand stressed that the stockman has a unique role in ensuring high standards of animal welfare and in order for this to be achieved, the stockman must be fully aware of the principles and practices of animal husbandry and must have a basic knowledge on disease prevention and treatment (FAWC, 2007). Likewise, the summary of scientific papers presented in the 3rd Network for Animal Health and Welfare in Organic Agriculture (NAHWOA) scientific workshop indicated that the stockperson's ability to understand livestock and respond to the needs of domesticated animals is the most important building block for animal health and welfare in any livestock production system (NAHWOA, 2000), however, the role of the stockperson has generally been neglected and underestimated (Hemsworth, 2008).

Considering the importance of stockmanship in the development of the livestock industry, this study aims to investigate the stockmanship competence of goat backyard producers and its relation to goat productivity and economic profitability. Stockmanship competence in this research is defined as the capacity of the livestock owner/stockperson to provide the needs of their animals for normal growth and reproduction. For goat-raising to be viewed as a potential source of income that will bring rural folks out of poverty, it is important to give attention to the stockmanship competence of farmers and that suitable livestock development policies and programs for its growth and development be formulated.

3.2. Methodology

3.2.1. Data gathering

The animal assessment method using stockmanship as proxy indicator discussed in Chapter I was used as the basis for gathering pertinent data from goat raisers to answer the objectives of this Chapter. Fieldwork was conducted between September 3-30, 2012 and March 4-17, 2013 in Ilocos Region of Northern Philippines. Farmer beneficiaries of Farmer Livestock School on Integrated Goat Management (FLS-IGM) were randomly selected. FLS-IGM is a season-long 6 month adult education course focusing specifically on goat production and marketing wherein participants meet once a week (half-day to whole-day) for technical lectures given by livestock extension workers from the local and regional offices. The curriculum covers mainly goat housing, feeding and nutrition, breeding, health and economic benefits of goat production. The handout of the FLS-IGM specifies the components of the training course, namely: conscientization which is a process of helping farmers see the realities through their own eyes by using problem tree analysis, transect walk and bio-resource flow map. Second is group dynamics which, accordingly, will solidify the good foundation started during conscientization. Unlike traditional training courses that are usually held in classroom settings, this FLS is field-based. Lectures are being held under shaded area or in village meeting halls. In coordination with the municipal agriculturist and livestock specialist, intensive data gathering through a semi-structured interview with farmers and ocular inspection on their goats and housing facilities were undertaken. The questionnaire that was prepared to gather information on farmers' stockmanship competence was based on

the indicators pertaining to housing, feeding, breeding and health which were discussed in Chapter 1.

Out of the 130 beneficiaries who finished the program in 2007, a total of 101 were interviewed. The reasons why 29 farmer beneficiaries were not able to participate in the interview were the following: they attended family reunion, went abroad, visited relatives, deceased, and have prior appointments. A group interview and an ocular inspection of the goat farm and goat housing facilities were conducted in Pugo and Mabini to verify farmer's answers. On the other hand, one-on-one interviews with farmers in Tagudin, Bani and Alaminos City were conducted near the farmers' goat house. In this case, ocular inspection on goat and goat housing were done simultaneously during the interview. Each question was read slowly during the group interview and farmers were instructed to choose or write their answers on the space provided for and/or select answers for multiple choice questions. In the one-on-one interviews, the interviewer wrote the answers of the farmers on the questionnaire for them. All questionnaires were collected after the group and individual interviews.

3.2.2 Data analysis

Scoring and method of computing stockmanship competence index score (SCIS) was based on the method discussed in Chapter 1. After computing for the SCIS, T-test was performed using SPSS to determine if there was significant difference in the productivity and income between lower and improved SCIS. Regression was used to determine which among the stockmanship competence indicators have more impact to productivity. Pearson correlation analysis was also carried out to check the correlation between SCIS, goat's productivity and income.

3.3. Results

3.3.1 Stockmanship competence index score before and after undergoing FLS-IGM

Table 3-1 shows the result of stockmanship competence index score before and after undergoing FLS-IGM. It shows that the mean SCIS before FLS-IGM were 38.52% and 75.81% after FLS-IGM implying that the stockmanship competence of goat raisers before undergoing FLS-IGM was low since it is lower than the neutral score of 50%. Considering that stockmanship can influence the welfare of the animal, result could also suggest that the status of goat's welfare before FLS-IGM was low. On the other hand, stockmanship competence after FLS-IGM was high suggesting high goat welfare after FLS-IGM. Based on this result, it could also be argued that farmers were able to learn technical knowledge on goat production such as proper housing, feeding, breeding, health and husbandry management, thus were able to improve their SC after attending FLS-IGM.

3.3.2. Goat productivity and farmers' income before and after FLS-IGM

It should be understood that, based on the interpretation of SCIS, before FLS-IGM represents low stockmanship competence which is parallel to low goat welfare while after FLS-IGM having high stockmanship competence is parallel to high goat welfare. If we look at then productivity and income derived by farmers from goat raising, result showed that there was a significant difference before and after FLS-IGM (Table 3-2). There was a 30.30 percent difference (4.91 kg increase) in the median weight of goat at 8 months old and at the same time, annual mortality and mortality rate have a percentage different of –40.00 and –91.89 respectively. In

addition, there was a 54.54 percentage difference on the population of goat in the farm or 3 heads higher after farmers have undergone FLS-IGM. With regards to the annual median net income derived by farmers from goat production, result showed that there was 127.34 percentage difference between low and high stockmanship competence. The increase of net income could be explained by the increased number of heads sold as a result of increase population of stocks in the farm. It can also be attributable to the increase of weight at 8 months old and decreased mortality rate. This suggests that high SC had contributed to the increased productivity and economic profitability of smallholder farmers while improving goat welfare.

3.3.3. Diseases/symptoms observed by farmers on their goat

Table 3-3 shows the diseases/symptoms observed by farmers on their animals before and after FLS-IGM. Result showed that before FLS-IGM, more diseases/symptoms were observe by farmers on their animals than after FLS-IGM. Majority (36.63%) of the respondents had observed 6 diseases/symptoms on their animals. These were orf, bloat, impaction, lameness, respiratory disease and diarrhea. On the other hand, farmers with improved SC showed that majority (40.59%) of them observed respiratory symptoms and diarrhea only. In this case, it can be argued that improved SC of farmers had led to fewer occurrence of goat diseases.

3.3.4. Factors influencing mature weight and mortality rate

Result of regression analysis showed that housing, feeding and health & husbandry competence index scores have a significant impact on the mature weight of goat, with housing and health as the strongest predictor among the four parameters.

Both have a P-value of .001 and with .312 and .316 coefficient respectively (Table 3-4). This means that a point increase in housing and health competence index scores would result to .312kg and .316kg increase in mature weight. On mortality rate, results demostrated that housing and health/husbandry competence index scores have statistically significant impact, with housing index score having the highest influence among the four parameters with -.453 coefficient. This means that a point increase in housing competence index score would decrease the mortality rate by .453. Result of regression analysis also showed that both housing and health have significant influence on mature weight and mortality rate while breeding competence index score showed no influence on both mature weight and mortality rate.

F-test delivered a statistically significant result on both mature weight and mortality rate implying that the regression model was reliable.

3.3.5. Correlation between SC, goat productivity and profitability

Result of correlation analysis shows that SCIS was highly correlated with mature weight and income. On the other hand, SCIS was negatively highly correlated with mortality rate. This means that as SCIS increases, mortality rate decreases and vise versa (Table 3-5). Low and high SCIS are both correlated to productivity but it should be understood that on the results low SCIS is equated to lower productivity as compared to high SCIS.

3.4. Discussion

Based on the data analyzed, it is evident that stockmanship competence has a significant influence on goat productivity and economic profitability. One of the major concerns in backyard goat production is its low productivity due to low mature weight and high mortality rate. Results of this study revealed that housing and health/husbandry parameters were the highest predictors for mature weight and mortality rate among the four parameters of stockmanship competence. This supports result of past studies that housing is one of determinants for improved productivity. Housing factors such as high ambient temperature, ventilation, reduced airspace and poor waste management inside the housing has an impact on the immune and endocrine response, and on the performance of sheep and goats (Sevi et al., 2007). Likewise, reduction of space allowance in housing affects feeding behaviour in goat (Loretz et al., 2004). This means that even if goats are provided with good forages and feeds, they might not consume much because feeding activity was reduced. In the same manner, ventilation is important in goat housing because it affects the thermal exchanges between the animal's body surface and the environment and is important in keeping levels of noxious gases and airborne particles and or micro-organisms (Sevi, 2005) that may lead to occurrence of diseases like pneumonia. In backyard goat production, these two parameters are often times overlooked. Native and upgrade goats are the common breed raised by farmers in this study. Before FLS-IGM, it was a common assumption by farmers that native and upgraded goats are adoptable to the local environment and have the ability to cope despite minimal or no housing, inadequate feeding, poor health and husbandry management such that farmers were less concerned on the goat's welfare. Under these production conditions, it leads us to

an assumption that the status of goat welfare of farmers before FLS-IGM was low because of farmer's low SC. This information could further lead us to an assumption that farmers have insufficient technical knowledge on proper goat production and welfare needs.

Like any other livestock, goat has its own needs for normal growth and development. Generally, characteristic of farmers with low stockmanship competence do not have housing or shelter facility intended for their goats. Goats were either tied under a tree or a post besides farmer's house. If housing was provided, it was not designed to give optimum protection, comfort and shelter. Indicators in this study for favourable goat housing such good ventilation, elevated from the ground so as not to be directly in contact with their feces and urine, divisions to separate males from females, proper spacing, height from floor to ceiling, loafing area, feeding and water troughs, proper orientation and location were not adequately achieved. Science-based research pertaining to ruminant housing parameters has an effect on health, behavior and production performance of the animal (Andrea et al., 1982; Weirenga, 1987; Sevi et al., 1999a) which could also explain why housing is the strongest predictor for mature weight and mortality rate.

In the same manner, feeding management is as important as housing in goat production. The basic nutritional requirements for goat include~~s~~ water, protein, energy (carbohydrates and fat), minerals and vitamins. Without providing these entire requirements, it can surely affect productivity especially that of pregnant and lactating animals. According to the ADM Alliance Nutrition, health and productivity comes with good nutrition. Goats are selective browsers, eating a wide variety of shrubs, woody plants, and even weeds and the availability of these browse materials in goat

pens and pasture appear to enhance their contentment. Likewise, research in ewe showed that undernutrition leads to reduced yield of milk, protein and casein and altered amino acid composition of milk (Sevi et al., 1998) that could affect the growth performance of their kids. Good-quality forages along with needed supplemental nutrients are necessary to achieve desired productivity. In this study, majority of farmers of low SC do not have their own forage and pasture area. Thus grazing is done in common pasture area and farmers were generally not aware of whether their animals have satisfied the daily nutritional requirements. Majority of farmers have insufficient knowledge on the nutritional needs of goats and feeding technology that can boost goat performance contrary to farmers with high stockmanship competence where feeding practices were directed towards meeting the feeding requirements of goats.

Though native goats have higher resistance to diseases (Davendra, 1999), being aware of the health condition should not be ignored. Production and managemnet practices of farmers oftentimes expose goats to injuries, lameness, endo and ecto-parasitic disease, blaot, respiratory disease, and other sort of disease. Diseases and parasites have for years been a problem in goat production causing millions of dollars in productivity losses (Alo and Saithanoo, 2006). Disease, if not treated at an early stage, will definitely compromise goat's productivity and welfare. Similarly, there are instances where goat needs care and assiastance such as in time of kidding and injuries. The level of goat's exposure then to diseases and injuries can also be dependent on the farmer's health and husbandry competence. Indicators such as strategic deworming, attending to animal's needs when sick, segregation of sick and healthy animals, assisting doe when suffering dystocia, treating injuries,

disinfection and age of castration are practices under health and husbandry competence that could prevent or minimize the occurrence of diseases. It is here where human-animal interaction plays an important role in sustaining healthy animals. Gentle treatments can be properly used during deworming and attending to animal's needs when sick, gestating and kidding. The quality of interaction with stockman is important because small ruminants are quite afraid of people and little accustomed to handling (Caroprese et al., 2008). Past studies also showed that gentleness reduced plasma cortisol response and have a positive effects on lamb meat pH and tederness (Napolitano et al., 2006).

Surprisingly, breeding competence in the study turned out to be insignificantly influential to mature weight and mortality rate despite that majority of the farmers were practicing upgrading. One of the components of FLS-IGM is the provision of breeder buck. In the past years, continuous upgrading of native stocks through the use of imported exotic breeds has been the convenient and popular approach to increasing goat productivity in the Philippines. Breeder buck has been provided by national and local government agencies to farmer goat association in the desire to increase productivity. The upgrading scheme aims to combine the superior production potentials of the imported stock with the hardiness and adaptability of the native goats to the local environment (Bondoc, 2005). However, results showed that breeding have not statistically influenced mature weight. This could mean that merely upgrading goats to increase productivity is inadequate if farmers are still anchored in poor production and management practices or stockmanship. It was noted that majority of farmers of low SC were not aware what age their goats were mated and do not know the reliability of the breeder buck. Majority of farmers do not separate the mature

male goat from the herd. In addition, male and female, small and large ruminant were mixed together in common pasture area which makes way for early maturing female goats vulnerable to early pregnancy along with the high risk of spreading diseases. There is probability also for inbreeding to happen in this production system. On the other hand, farmers with improved SC have improved their practices on these parameters.

Results thus suggest that low stockmanship competence denotes low animal welfare. It was evident that the productivity of goat under farmers of low SC was compromised as opposed to the productivity of goats under farmers with improved SC. This means that high stockmanship had resulted to higher productivity and welfare. This in turn was beneficial to farmers because farmers were able to realize higher profit from backyard goat production. Thus, it can be argued also that improving stockmanship competence of backyard goat raisers can be a reliable way to increase the economic contribution of backyard goat production while at the same time maintaining the animal's welfare.

3.5. Conclusion

Based from the results of the study, farmer's stockmanship competence clearly demonstrated its importance in achieving higher goat productivity, profitability and welfare. Low stockmanship competence clearly demonstrates low technological inputs on housing, feeding, breeding and health/husbandry management system. This increases the vulnerability of goat to diseases which compromised its ability to be more productive and contribute to farmer's income. On the other hand, high stockmanship competence resulted to higher productivity, profitability and welfare.

Improving stockmanship can be a point of reference and a reliable way of improving the backyard goat industry through improved productivity and at the same time, goat welfare in the Philippines.

Farmer's stockmanship competence clearly demonstrated its importance in achieving higher goat productivity, profitability and welfare. High stockmanship competence had led to higher goat productivity interms of mature weight, mortality rate and population of stock and fewer disease observed by farmers on their goat. These results had led to higher profitability derived by farmers from backyard goat production. Housing, feeding and health and husbandry competence of the stockperson had significantly influnced the increase in goat productivity. Improving stockmanship competnce of goat raiers can then be a point of reference to improve backyard goat industry.

Table 3-1. Stockmanship competence index score of farmers before and after undergoing FLS-IGM

	N	Median	Mean	Std
Stockmanship competence index score before FLS-IGM	101	37.21	38.52	11.43
Stockmanship competence index score after FLS-IGM	101	76.74	75.81	6.37

Table 3-2 Productivity and income difference before (low SCIS) and after (high SCIS) FLS-IGM

Specifications	Before FLS-IGM (low SCIS) (Median)	After FLS-IGM (improved SCIS) (Median)	% Difference	P(T<=t) two-tail	Result of improved goat stockmanship
Mature weight of goat at 8 months old (kg)	14.00	19.00	30.30	0.000	Increased
Annual mortality (hd)	3.00	2.00	40.00	0.025	Deceased
Annual mortality rate (%)	30.00	11.11	91.89	0.000	Deceased
Population of goat in the farm (hd)	4.00	7.00	54.54	0.000	Increased
Annual Net Income (P)	802.68	3616.21	127.34	0.000	Increased

Table 3-3 Diseases/symptoms observed by farmers on their goats

Diseases /sypmtoms observed by farmers on their goats	N	%
Low stockmanship competence index score		
Orf, bloat, impaction, lameness, respiratory disease, diarrhea (6*)	37	36.63
Orf, bloat, lameness, respiratory disease, diarrhea (5*)	29	28.71
Bloat, respiratory disease, dirrhea, pink eye (4*)	14	13.86
Orf, respiratory disease, diarrhea (3*)	21	20.79
High stockmanship competence index score		
lameness, bloat, orf, respiratory disease, diarrhea (5*)	27	26.73
diarrhea, lameness, orf, respiratory disease (4*)	19	18.81
respiratory disease, diarrhea (2*)	41	40.59
Respiratory disease (1*)	14	13.86

*number of diseases/symptoms observed

Table 3-4 Factors influencing goat mature weight and mortality rate

Stockmanship parameter index score	Productivity	
	Mature weight	Mortality rate
	Unstandardized Coefficient	Unstandardized Coefficient
Housing competence index score	0.312***	-0.453***
Feeding competence index score	0.236**	-0.116
Breeding competence index score	0.069	-0.116*
Health & husbandry competence index scc	0.316**	-0.228**
R^2	0.282	0.338
Adjusted R^2	0.253	0.311
F-statistic	9.447	12.270
Probability (F-statistic)	0.000	0.000

* p< 0.05; **p< 0.01; ***p< 0.001

Table 3-5 Correlation of SCIS, goat productivity and profitability

Specification	Low SCIS	High SCIS
Mature weight (8mos old)	.660**	.469**
Mortality rate	-.445**	-.503**
Income	.382**	.540**

** Correlation is significant at the 0.01 level (2-tailed)

CHAPTER 4

IMPROVING STOCKMANSHIP COMPETENCE THROUGH CAPACITY DEVELOPMENT

4.1. Introduction

Taking into account the importance of farmer's stockmanship competence in animal welfare, it can be argued that improving it would mean improving the welfare of the animal. It is then necessary to investigate factors that can improve farmer's stockmanship competence. One of the most common approaches in developing or improving the capacity or competence of group of farmers is capacity development. The need for capacity development is often identified when performance is inadequate or falters. It is always assumed that capacity is linked to performance hence capacity development in the form of training was implemented. Trainings have always been part of the national and local programs aiming to impart result of goat science and technology to farmers. It is believed that by increasing the technical knowledge of farmers on contemporary goat production and management practices, production and productivity will increase. However, despite the consensus that capacity development intervention in the form of training is important to create change, it is not yet clear what outcome to expect from such intervention with regards to change in behavior of farmers towards goat production and management practices.

Behavioral change is a new buzz phrase for policy makers. Traditionally, the focus of policies has been to change behavior using external drivers (Collier et al, 2010). However, addressing behavior is a significant challenge for reformers (UNDP, 2008). It needs recognition that individuals are the drivers of change and there is a

real diversity in the livestock industry. Behavioral change (BC) is about transformation, it represents the different actions of an individual (Pike, 2008) and the theory of planned behavior (Ajzen, 1985) can be a starting model to go through in order to understand factors that can be associated to BC.

In the study of Williams, S., et al, 2012, she includes technical knowledge as a predictor of behavioral intention. The application of knowledge is now recognized to be one of the key sources of growth in the global economy and the term Knowledge Economy (KE) has been coined to reflect this increased importance of knowledge. A knowledge economy is one where organizations and people acquire, create, disseminate, and use knowledge more effectively for greater economic and social development (World Bank, 1999).

On the other hand, motivation also plays an important role in influencing people to do something. It is an important first step toward an action that can affect individual reactions to government interventions (Diclemente, Bellino and Neavins, 1999). Researches pertaining to personal health have reported the importance of individual motivation on how people affect their behaviors. This case could also be modeled in different issues like behavioral change in livestock or goat production and management practices. This study investigates not only knowledge, but also motivation as factors linked to farmer's behavioral change. It aims also to determine the factors attributable to the increase in knowledge and verify the correlation of knowledge and farmers' behavioral change in their production and management practices.

4.2. Methodology

4.2.1. Data collection

Interview guide was used to gather information from farmers and staff memberes of the Local Government Units (LGUs) who were directly involved in the conduct of the Farmer Livestock School. This type of interview was selected to encourage free and open responses from the target-interviewees, capturing respondents' perceptions and experiences in their own words and perspectives. A group interview per municipality with the help of the LGU in charge of the livestock programme was organized. The LGU called for a special meeting through individual call or text messaging which is now an effective strategy in calling for an official meeting in the rural area.

Five different schedules for interviews were scheduled per municipality based on farmer's availability – April 5, 14, 19, 20, 21, 2011 in Tagudin, Ilocos Sur; Pugo, La Union; Bani, Mabini, Alaminos City, Pangasinan, respectively. The purpose of the interview was explained to the farmers before the questionnaires which were used to obtain farmer's profile, motivation, farmer's perception of their behavioural change and changes in their actual production and management practices were distributed for answering.

Questions were read slowly, one at a time, during the group interview and farmers were instructed to write their answers on the space provided for and/or select their answers which were provided in the multiple choice. All questionnaires were collected after the group interview. After the respondents finished answering the questionnaire, a 25-point test was given to measure the individual knowledge gained. The content of the 25-point test was the same as the pre-test given by the facilitators

during the first day of the project implementation. The test included proper goat production and management practices for housing, feeding, breeding and health management. The pre-test results were gathered from the LGU filed document.

4.2.2. Data analysis

The following equation was employed to determine the factors influencing increase in knowledge: $\Delta KG = B_0 + B_1X_1 + B_2X_2 + \ldots B_nX_n$ where ΔKG is the change in knowledge; B_s are the coefficient of independent variables; X_s are the independent variables. Scheffe' Method of Multiple Comparisons was used to distinguish differences between groups and qualitative analysis was employed in correlating motivation and perception on behavioral change.

4.3. Results and Discussion

Participants who attended the season long livestock school course have their own motivation in attending the training. The motivation of farmers in attending FLS-IGM is presented in Figure 4-1. In this case, 6 motivations drove farmers to attend FLS-IGM. Out of the 101 respondents who graduated in 2007, the driving force that made majority (43%) to attend FLS-IGM was to gain knowledge on goat production, followed by the following: consider goat raising as a business (16%), benefit from government support and improve technical skills (both 14%), use of spare time wisely and socialize with co-farmers with 8% and 5% respectively.

The test performance of the farmers before and after the attendance of FLS-IGM grouped by motivation is presented in Table 4-1. Result shows that considering goat raising as a business (M4) has the highest (143%) increase in knowledge,

followed by benefit from government support (M1) and improvement of technical skills (M3) with both 135% increase. To use spare time as a motivation (M5) accounted for 112% and to socialize with co-farmers (M6) for a 110% increases in knowledge.

Scheffe Multiple Comparison showed that although there is no significant difference between groups in the pre-test scores, there was a highly significant difference between the groups in the post test (F=6.267; P=.000). M1 was significantly different from M2 (P=.061) and M4 (P=.000) and likewise, M2 was significantly different from M4 with a p value of .049. This implies that individuals' motivation is an important determinant in the knowledge gain of participants. Entrepreneurial motivation, in particular, resulted in higher knowledge gained compared to the other motivations.

Considering knowledge as an element for behavioural change, Table 4-2 presents other factors that are attributable to the increase in knowledge. Number of years in school or education as a factor is common in the discussion of capacity development. Most likely, higher number of years of education can result in higher test score as also confirmed in the Table. The mean year of education is 11 years which implies that majority are high school level. High school level could indicate an easier communication compared to that of the participants who did not go to school at all. In addition, results showed that the number of attendance to organizational meetings was linked to the increase in knowledge. In the rural setting, farmers with the same interest have their own organization. After graduating from FLS-IGM, the farmers formed their own organization with an average of 11 meetings in a year. In these meetings, they shared their plans, formulate activities, discussed

problems/issues and experiences on goat production and management. This implies that organizational meetings serve as an important source of information to farmers on goat production and management which may explain why attendance to organizational meetings was significantly related to the increased knowledge.

In addition, how training was conducted and how it satisfied the participants was important. Respondents perceived that the training was participatory in nature and they were satisfied of the over-all training course. These two aspect of the training also showed a significant link to the increase in knowledge. This implies that the more participatory the training is and the more satisfied the participants are of the over-all course, the higher will be the level of knowledge gained. On the other hand, individual satisfaction and performance were related (Judge et al., 2001). Many studies have been carried out about job satisfaction and performance (Ahmad *et al.*, 2010; Judge et al., 2001; Lawler et al., 2008) and this concept could be applicable also to training satisfaction and knowledge gained. It is suggested that training programs should adopt a participatory approach that will make participants feel involve throughout the training.

Lastly, prior attendance of trainings before attending another related training was significantly related to the knowledge gained. This means that prior knowledge which was acquired from prior trainings may have enhanced and complimented their newly acquired knowledge from FLS-IGM. Prior knowledge of a specific topic then can enhance understanding and thus can make learning easier for them.

Figure 4-2 shows the respondents' perception of their change in behavior on their production and management practices after attending FLS-IGM. The graph shows that the perception of behavioural change by motivation was significantly

different from each other. Majority (78%) of the respondents under M1 perceived that their behaviour changed much, indicating that respondents were able to have changed 5-8 old PMP into a new one. Likewise, respondents under M3 and M6 showed also that majority, 56% and 60% respectively, perceived that their behavior changed much. However, there was only a slight difference from the respondents who perceived a very significant change (with 9 and above old PMP into a new one) in their behavior compared to the respondents under M1.

The perception of the respondents under M2 and M4 (majority, 56% and 71% respectively), indicated that their behavior changed very much but the difference was not significant from those who perceived a considerable (much) change. Fifty: fifty of the respondents under M5 perceived that their behavior changed much and very much. In this result, it is highlighted that among the six motivations, respondents under M4 showed the highest respondents who perceived that their behaviour changed very much. Based on the study of Freeman et al, 2011, individual perception can be translated into relevant actions. He further added that traditional cognitive theories indicate that transformation from perception to action is accomplished by serial non-overlapping processing stages: perception-cognition-action.

If we examine Table 4-3, which shows the actual behavioural changes in goat production and management under different motivations, respondents under M4, who perceived that their behaviour changed very much, has still the highest behavioral changes in their actual production and management practices. This implies that entrepreneurial motivation can elicit behavioral change better than the other 5 motivations.

A large number of studies (Sinkula et al., 1997; Dwyer et al., 2007; Carrol et al., 1991) have been related to both knowledge and behavioural change. In the present study, there was a significant correlation (p=.406) between knowledge and perceived behavioural change after attending FLS-IGM (Table 4-4). Realizing how important knowledge is related to behavioral change, it is empirical that imparting knowledge on goat production and management practices to smallholder goat raisers in the rural area be of an utmost concern of development planners and policy makers to change their current behavioural practices. But then again, it should be understood that motivation of each individual plays a role in knowledge gain which should not be overlooked also.

4.4. Conclusion

Although training is one of the most common interventions for increasing the knowledge of farmers on the innovative livestock technologies however, it is essential to understand the implication of individual's motivation in attending trainings in conceptualizing a sound development plans. Based on the results, years of education, average number of organizational meetings attended, number of training before attended FLS-IGM and course is participatory and satisfactory have significantly influence the post test score or increase in knowledge. In addition, it can also be argued that motivation of participants in attending training affects the knowledge gained and perceived behavioural change. It is possible that individuals who are motivated of getting benefits (rewards) from the project are actually less interested in the training itself and thus less knowledge gained and behavioural change. Results revealed that respondents with entrepreneurial motivation showed the highest

increase in knowledge and the highest perception on behavioural change on goat production and management practices which is manifested in their actual practices. It is then suggested that development plans aiming at improving behavioural change on livestock production and management practices boost the entrepreneurial motivation of participants. Realizing how important knowledge is to behavioural change, imparting knowledge on goat production and management practices to smallholder goat raisers in the rural area should be an utmost concern of development planners and policy makers to change current behavioural practices. But then, it should be understood that motivation of each individual plays a role in knowledge gain which should not be overlooked.

Table 4-1 Result of pre-test score and post-test score by farmer's motivation

Motivation	Pre-test score		Post test score		%
	Mean	SD	Mean	SD	Increase
M1 (benefit from government support)	7.78	2	18.35	2.23	135.86
M2 (gain knowledge in goat PM)	9.14	1.96	20.5	2	124.29
M3 (improve technical skills)	8.85	2.24	20.85	2.74	135.59
M4 (consider goat raising as a business)	9.31	2.05	22.68	1.85	143.61
M5 (use spare time wisely	10	2.44	21.25	2.87	112.5
M6 (socialize with co-farmers)	9.6	2.88	20.2	2.16	110.42
Over-all	9.03	2.13	20.66	2.41	128.79

Table 4-2 Factors attributable to post-test score of farmers

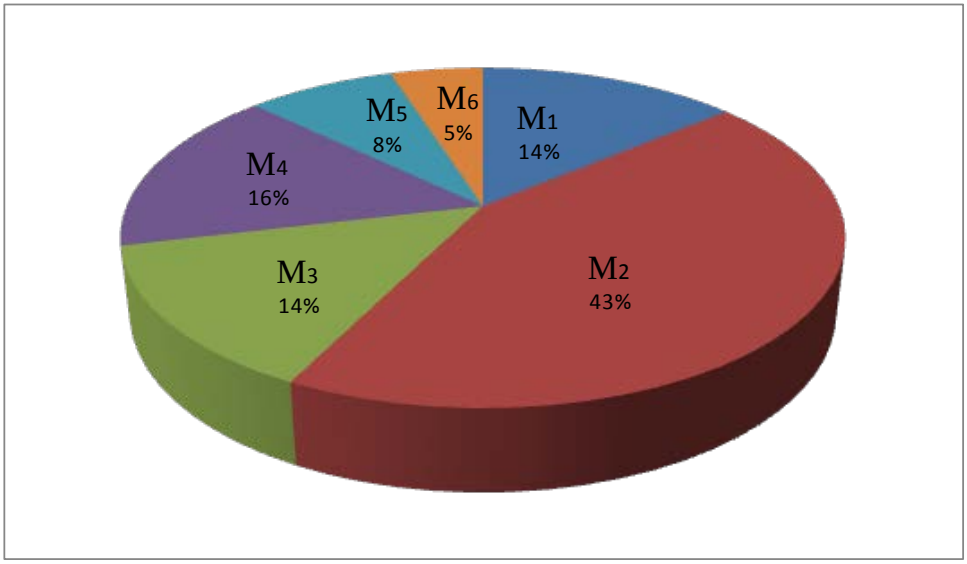
Variables	Standard Coefficient	t-statistic
Dependent Variable		
Knowledge (Post Test Result)		
Independent Variables		
Constant	4.82	2.221
Sex	0.095	0.308
Years of education	0.516***	7.194
Ave. number of organizational meetings attended per year	0.497***	4.444
Perceived over-all course's satisfaction	0.922**	2.272
Age	0.007	0.511
No. of years raising goat before FLS	0.004	0.193
Course is participatory	1.933***	4.391
Course contents were easily applied	0.037	0.96
Facilitator is highly knowledgeable and motivated	0.305	0.819
No. of participants is just right	0.063	0.147
No of trainings attended on goat production before FLS	1.197**	2.678
No. of trainings attended on goat production after FLS	0.042	0.13
Adjusted R-squared	0.679	
Std. Error of Estimate	1.370	
F-statistic	18.617	
Prob (F-statistic)	0.000	

*** significant at 0.01; ** significant at 0.05

Table 4-3 Correlation between knowledge and farmer's perceived behavioral change

		(Log) Perception on BC after FLS-IGM
Knowledge after ((Log) Result of post test)	Pearson Correlation	.406**
	N	101

** correlation is significant at 0.01 level (2-tailed)



M1 (benefit from government support)
M2 (gain knowledge in goat PM)
M3 (improve technical skills)
M4 (consider goat raising as abusiness)
M5 (use spare time wisely
M6 (socialize with co-farmers)

Figure 4-1 Motivation of farmers in attending FLS-IGM

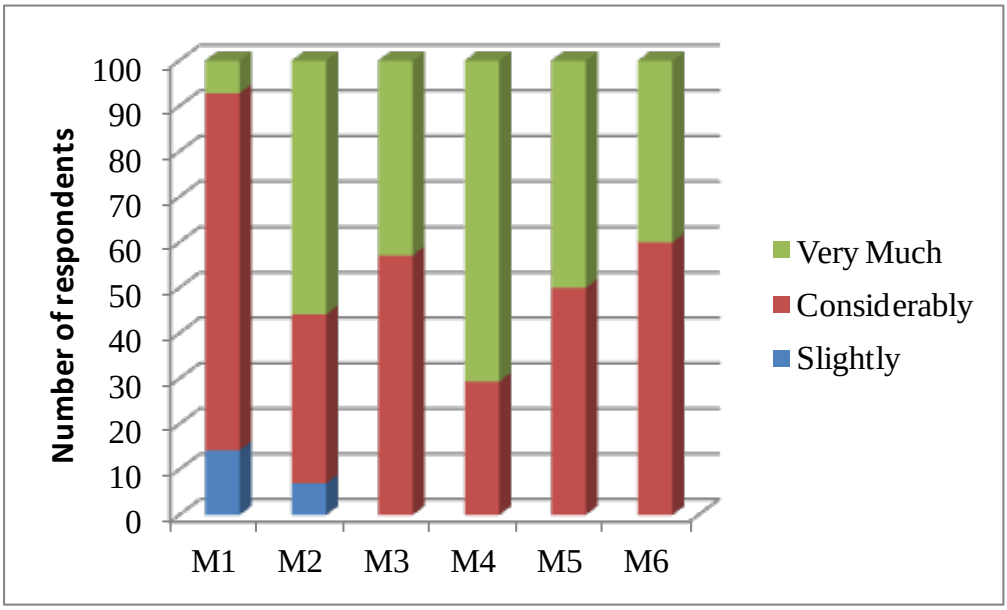


Figure 4-2 Categorized perceived behavioral change of farmers on their goat PMP after attending FLS-IGM

CHAPTER 5

A CASE STUDY ON FARMERS' PRODUCTION PRACTICES AND ITS RELEVANCE TO ANIMAL WELFARE

5.1. Introduction

Goat-raising is seen as a promising enterprise for people living in rural areas. However, the problem of gastro-intestinal parasites still looms the industry diminishing its potential to contribute significantly to poverty alleviation. Infestation of internal parasites (IP) is arguably one of the most critical issues that affect animal welfare, not just in goat production, but in the livestock industry as a whole. This is because IP depress and, in worst cases, purge the animals' potential to contribute economically to farmers' income through direct and indirect loses. Direct loses refer to death, poor gains, and reproductive inefficiency; while indirect loses stem from increased susceptibility to secondary infection and greater labor needs (Stevenson, et al., 2012). Likewise, worm infestation leads to increased production costs due to elevated treatment costs, hence, farmers will not able to reap the full potential of goat production.

In the Philippines, the humid tropical environment of the country favors the growth of internal parasites in small ruminants. Early reports on helminth parasites in goat can be traced back in 1960s where 2 species of nematodes and 2 species of trematodes were identified (Ducusin, et al., 1996). In 1986, an extensive study of Eduardo reported the presence of 10 families, representing 13 genera and 14 species of helminth parasites in small ruminants. Report shows that over the past decades, the

presence of reported helminth parasites had increased which has now become one of the major obstacles in the development of the goat industry.

According to the data of the Bureau of Agricultural Statistics in the Philippines (2013), almost 98% of the goat industry is backyard-operated. It was only during the past few dacades that goat production gained the attention of government development programs and research and development efforts (FADGC, 2012). One of the most fundamental programs implemented that was geared towards addressing the issues in the goat industry is capacity development of backyard goat raisers through the conduct of technical trainings on proper goat production and management practices. Like other forms of capacity development programs, it is understood that improving the technical capacity of farmers in goat production will help improve their stockmanship competence to enable them to produce healthy and productive animals. Trainings conducted were not limited to the aspects of production but encompass approaches on how to prevent or control internal parasites in goats through the use of either anthelmentics or proper management practices.

The objective of this study is to investigate the implication of farmer's knowledge on goat production and management practices to the prevalence of gastrointestinal parasites and identify production practices associated to parasite infestations.

5.2. Methodology

Data gathering was conducted in February 9-26, 2014 in Region I. Information about farmers who attended FLS-IGM and goat raisers without technical training on goat production were retrieved from the LGU and names for both groups

were randomly selected by draw lots. Together with the livestock technician, one-on-one interview and fecal sample collection were made after seeking approval from the farmers. . Fecal samples were collected from 95 randomly selected mature goats (7-month old and above) of farmers who have attended FLS-IGM and from 45 goats of farmers who have no training on goat production.

Fecal samples were collected directly from the rectum of each goat with a small amount of lubricant on the finger so that it will not cause much pain on the animal. Around 10-15 fecal pellets were collected. Samples were put into a small plastic bag, with 4-5ml of 5% formalin, labeled and placed in a cooler with ice packs to prevent the eggs from hatching during long travel before they reach the nearest Animal Diagnostic Laboratory for fecalysis. The McMaster method was used to identify parasites and egg count per gram.

The cut-points of worm infestation depend on the egg count per gram (EPG). As a general guide, a level of about 500 EPG of feces would indicate that worming is needed for sheep or goats (Tritschler and LeaMaster, 1998). In this study, the following were used to group the animals according to its EPG level: low $\leq$ 500 EPG; moderate >500 to 1000 EPG; high >1000 but $\leq$ 2000 EPG; and severe >2000 EPG. This was derived from the handbook for the control of internal parasites of sheep and goats, 2012. In the research, >2000 was added to the cut-point to reflect the severity of EPG level making it 4 points for the level of infestation.

Independent sample T-test making use of the Statistical Package for the Social Sciences (SPSS) program was carried out to determine if there were differences production practices of goat raisers and in EPG of goat parasites between farmers

who have undergone training and those who have not. Regression analysis was used to determine the factors related to the EPG.

5.3. Results and discussion

5.3.1. Production practices associated to gastro-intestinal parasites in goat

Results showed that there were similarities and differences in the production practices between farmers who have undergone training on goat production and those who have not (Table 5-1). Similarities were found on the deworming and wilting practices in newly cut forage before feeding to goats where t-test showed no significant difference. Both groups deworm goats only when symptoms of parasitic infestation such as diarrhea, rough hair, paleness around the eyes and worms on the feces [Reynolds, 2014] were observed. These were the strategic ways by the respondents in controlling and minimizing parasite infestation with the use of a dewormer. Results imply that both groups were aware of the symptoms of parasite infestation and strategic ways of using a dewormer. It was also common among the farmers to gather vegetation from anywhere in their rice field or from common pasture areas where parasite contamination would be possible. For this reason, wilting newly cut vegetation is recommended to allow possible larvae to fall off from the leaf blades of gathered vegetation before feeding.

On the other hand, there were significant differences between the two groups in the provision of goat housing, time of grazing, stall feeding during rainy season, grazing of goat in common pasture areas and provision of minerals and feeds at a time of forage scarcity. Like any other farm animals, it is important to provide shelter for goats to protect them from rain, cold, heat and dampness which could severely

affect the animal's vigor and make them susceptible to parasitic infestations. In the same manner, feeding goats with the appropriate ratio is important. In this study, feeding practices of farmers falls under tethering and extensive grazing. With regards to tethering, goats were usually tied up with a 3-4 meter rope where the goats are rotated to different areas within the field once or twice a day so they could browse on fresh vegetation. On the other hand, some goats were let loose to browse a common pasture area to feed on whatever forage is available, including waste vegetation or hedge after rice or crop harvesting, which is prevalent in extensive grazing practice. In addition, sources for drinking water during grazing were irrigation ditch or canals, rivers or ponds. These types of feeding practices by backyard goat raisers do not guarantee the much needed nutrition for the goats on a daily basis, especially, during the dry season. Hence, most goats are often under-nourished. If there is not enough vegetation for goats to feed on along with the lack of supplemental feeds and minerals, goats' health condition would surely be compromised. Absence of shelter and deprivation of basic nutritional needs could lead to the weakening of an animal's immune system thereby increasing its vulnerability to parasites. According to past research findings, well-fed animals can better withstand parasite infection than animals with an inadequate diet and parasites interfere with the ability of goats to utilize nutrients efficiently (Miller, 2014). Healthy goats are more capable of coping with gastrointestinal parasites given that their nutritional needs are met [Metre, 2010].

Stall feeding is recommended during rainy season to prevent goats from being infected with parasites. Past studies showed that most internal parasites are picked up by goats during the wet season (Peacock, 1996) than in dry season. In the same manner, it is recommended to graze goats when dew on vegetation is dried because

moisture on forages allows larvae to go up to the plant's leaf blade making them easily ingested by a grazing goat. It is also likely that larvae are washed off by rain into the irrigation ditches and ponds where goats usually drink from. In addition, it is common in backyard goat production that goats are being grazed or tethered in a common pasture area due to lack or insufficient forage areas. It is very typical to see both small and large ruminant animals of different ages grazing all together in common pasture area. With this feeding practice, prevention or minimization of infection in goats caused by internal parasites would be difficult to achieve.

Results show that almost all (98.90%) farmers with training have provided housing for their goats as compared to farmers without training (54.50%). Grazing the animal late in the morning, always practice complete confinement during rainy season, seldom graze goat in common pasture area and always provide minerals and feeds to goat when scarcity of forage was experienced were the common production practices of farmers who were able to attend training. This implies that production practices of farmers with training were geared more towards the prevention and control of parasite infestation in goats as compared to farmers without training.

5.3.2. Egg count per gram of gastro-intestinal parasite in goats

The result of McMaster examination showed that Strongyle Type (ST) was the only parasite found in all samples collected from both groups. Since there was a wide range of distribution in egg count per gram, data was transformed into its logarithm base 10 to normalize the range of distribution of EPG of goats from both groups. Log transformation was employed to reduce or normalize the wide disparity in the distributions. The Levene's test for equality indicated that the variances

between the two groups (with training and without training) were not significantly different with p-value equals to .081, thus, the equal variance assumed was considered. The result of the independent sample T-test showed that there was a significant mean difference in the EPG of ST parasite between the goats of farmers who have attended training and the goats of farmers who did not attend the training which was at 0.01 significant level (Figure 4-1).

The EPG of ST parasites in goats owned by farmers with training was fewer than the EPG of ST in goats owned by farmers without training. This means that farmers who had training were more knowledgeable on the PMP that can prevent or minimize parasites in their goats. This could be explained by the differences in the production practices of both groups discussed above.

5.3.3. Level of infestation

It is also evident in Table 4-3 that the difference in the production practices of both groups had led to the difference in the EPG infestation level of goat. Results showed that the percentage of goats with low infestation was higher (61.05%) among goats owned by farmers who had training as compared to goats of farmers without training (38.64%). At the same time, lower prevalence of moderately, highly and severely infected goats were observed among farmers who had training as compared to goats of farmers without training (30.53%, 9.47% and 2.11% respectively). Moreover, farmers without training had higher percentage of goats under high (15.90%) and severe infestation (9.10%). This result implies that the goats of trained farmers have lower incidence of high and severe parasite infestation as compared to the goats of farmers without training.

5.3.4. Production practices influencing egg count per gram of parasite in goats

Table 4-4 shows the production practices of farmers that have significantly influenced the EPG of ST parasites. Result of regression analysis showed that provision of housing, practice of complete stall feeding during rainy season, free grazing of goats in a common pasture area and provision of minerals and feeds/concentrate when forage is scarce were the practices which have significantly influenced the EPG of ST parasites in goats. This means that provision of housing, practicing complete confinement during rainy season and provision of minerals have led to the decrease in the EPG of ST parasite by 397.589, 267.289 and 303.738, respectively. Likewise, increased frequency of grazing the goat in a common pasture area had led to the increase EPG of ST by 258.248. It is then suggested that these production practices should be given attention for they are very important in minimizing ST parasite infestations in goats. Compromising production practices associated with worm infestations can bring significant loses in the goat industry.

5.4. Conclusion

Based on the analysis of data on the prevalence of parasites in goats owned by farmers with and without training, it was evident that farmers who had training were more knowledgeable with the proper production practices associated with parasite control. As a result, their goats have significantly lesser ST parasites as compared to the goats of farmers without training. It is also be concluded that the prevalence of internal parasites is highly influenced by sound production practices such as the provision of appropriate goat housing, complete stall feeding during rainy season,

grazing in a common pasture area and good nutrition through provision of feeds and minerals at times when forage is scarce. Compromising these production practices are highly associated with worm infestations which could bring significant loses in the goat industry. In order for goat-raising to be considered as one of the potential solutions for poverty alleviation; addressing the issue on parasite infestations in goats is virtually important. This can be done through capacity development programs for goat raisers. The information in this study could be used to justify investments on capacity development projects for backyard goat raisers to promote the development of the goat industry.

Table 5-1 Differences on production and management practices of farmers with and without training

Production Practices	With Training (N=45)	Without Training (N=25)	Significant level
Provide goat housing			
yes	98.90	54.50	***
no	1.10	45.50	
Practice deworming			
yes	60.00	59.10	ns
no	40.00	40.90	
Time of grazing the goat			
early morning	26.30	56.80	**
late in the morning (9:00 am onwards)	73.70	43.20	
Practice complete stall feeding during rainy season			
no	8.40	29.50	**
sometimes	29.50	36.40	
always	62.10	34.10	
Wilt newly cut forage before feeding to goats			
yes	52.60	38.60	ns
no	47.40	61.40	
Freely graze goat in a common pasture area			
no	45.30	27.30	***
seldom	51.60	45.50	
often	3.20	27.30	
Provide minerals and feeds/concentrate when forage is scarce			
no	10.00	29.50	**
sometimes	26.30	31.80	
always	63.20	38.60	

** $p < 0.05$; *** $p < 0.001$; ns is not significant

Table 5-2 Level of ST parasite infestation in goats from farmers with and without training

EPG infestation level	Prevalence of Strongyle Type worms in goat (%)	
	Goats from farmers with training N=95	Goats from farmers without training N=45
[1]Low infestation	61.05	38.64
[2]Moderate infestation	29.47	36.36
[3]High infestation	8.42	15.90
[4]Severe infestation	1.06	9.10

[1]<500EPG; [2]500-1,000EPG; [3]1,001-2,000EPG; [4]>2,000EPG

Table 5-3 Production practices significantly influencing the EPG of ST parasite

Production practices	Unstandardized Coefficient
Dependent variable	
EPG of ST parasite	
Independent variables	
Constant	2395.416
Provide goat housing	-397.589**
Practice deworming	-146.540
Time of grazing the goat	170.414
Practice complete stall feeding during rainy season	-267.289**
Wilt newly cut forage before feeding to goats	-75.602
Freely graze goat in a common pasture area	258.246**
Provide minerals and feeds/concentrate when forage is scarce	-303.738***
R^2	0.660
Adjusted R^2	0.642
Standard error of estimate	451.720
F-statistic	36.303
Probability (F-statistic)	0.000

**p< 0.01; ***p< 0.001

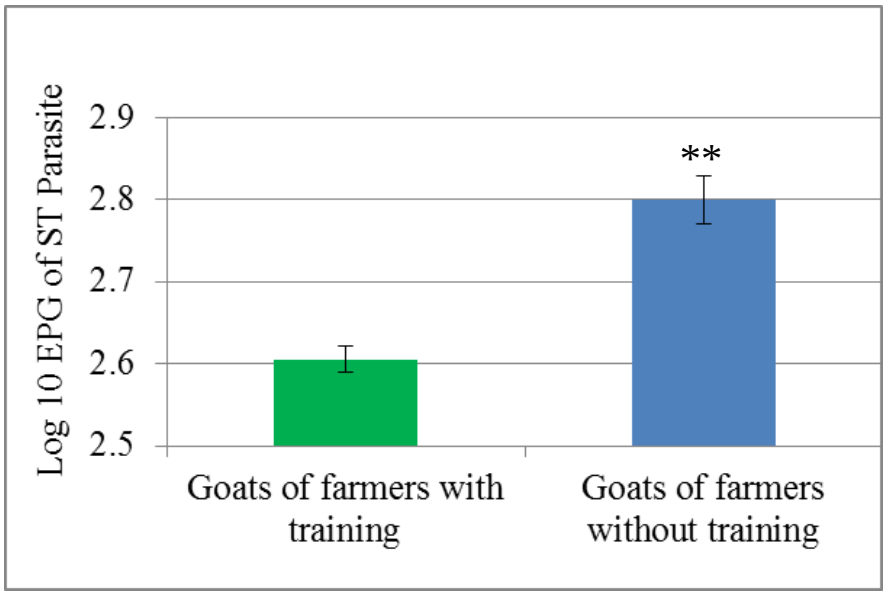


Figure 5-1 Difference of EPG of ST parasite from goats of farmers with and without training

CHAPTER 6

GENERAL CONCLUSION

Livestock is an indispensable commodity in the pathway of poverty alleviation. It is critical for many for it supports their livelihood and food security. However, it should be understood that its socio-economic contribution could be dependent on the welfare state of the animal. The discussion of Animal Welfare (AW) had been increasing since mid 90s and is now an important global issue in the livestock industry. Its scientific study could be dubbed as relatively young but it is known for a fact that the scientific research on animals' physiological and biological processes have been done since time immemorial; hence animal welfare is a well established scientific discipline. Past scientific research have been the bases of understanding and evaluating animal welfare.

With regards to its definition, the diversity of what researchers consider to be indicators essential to certain aspects of animal welfare had led to its varied definitions. This means that there is no universal definition of animal welfare yet; however, there is a common understanding that animal welfare is in itself about the animal physiological and biological functioning. Its multifaceted dimension had led to different methods of assessment, with foundation based on what particular category or welfare indicator has been given more importance. Measuring AW is a newly emerging area of research and it needs multidisciplinary way to achieve it. In developing countries, hardly any studies in assessing animal welfare have been done in backyard livestock operation. In this research, a model for assessing welfare on the backyard level using stockmanship competence (SC) to reflect the status of animal

welfare was conceptualized. The set of parameters used in this method were based on the Philippine recommends on goat production and tips on goat raising. This research argues that on-farm assessment of animal welfare could also be possible by assessing the SC of farmers because stockmanship denotes the comprehensive and holistic approach to livestock handling. Stockperson live, work and communicate with animals, in this sense, stockmanship could play an important role in animal welfare.

Implication of animal welfare on livestock productivity and profitability was analyzed by gathering pertinent information making use of the assessment method that was conceptualized. One hundred-one (101) backyard goat producers who had undergone farmer livestock school on integrated goat management (FLS IGM) were interviewed. Data on farmer's profile, production and management practices, goat productivity and farmer's income before and after FLS-IGM were gathered. Result showed that the mean number of goats raised per household was 4 and that majority (52.79%) of the farmers were raising native goat. The computed mean stockmanship competence index score (SCIS) before and after undergoing FLS-IGM was 38.53% and 75.81% respectively, denoting poor SC of farmers before FLS-IGM and high SC after FLS-IGM. Both index scores resulted to significant differences in productivity and income. The median mature weight and mortality rate of goats before FLS-IGM (low SC) was 14kg and 50% respectively. On the other hand, productivity of goats of farmers after FLS-IGM (high SC) have increased where in the median mature weight increased 19kg and mortality rate decreased to 11.11%. Likewise, fewer goat diseases were observed by farmers. With regards to income, there was 127.34% difference on the median net income derived by farmers after FLS-IGM. Result implies that

improving animal welfare through stockmanship competence can lead to increased productivity and income derived by farmers on backyard goat production.

Taking into account the importance of farmer's stockmanship competence in animal welfare, it can be argued that improving it would mean improving the welfare of the animal. It is then necessary to investigate factors that can improve farmer's stockmanship competence. One of the most common development approaches is capacity development of farmers through training. Capacity development has been one of the main agenda of international, national and local organizations. One of the most common strategies to develop the capacity of farmers is through technical training. It is through training where participants could increase their knowledge and skills. In this research, factors attributable to the increase in knowledge of farmers who attended FLS-IGM were identified. After regression analysis, findings showed that years of education, number of organizational meetings attended per year, over-all course perceived as highly satisfactory and participatory and number of training/seminar attended before FLS-IGM were the significant factors attributable to the increase in knowledge of farmers. Although knowledge was correlated to perceived behavioral change, participants with motivation of considering goat raising as a business (entrepreneurial motive) has the highest increase in knowledge (143%) and the highest (very much) perceived behavioral change that was reflected in their actual production and management practices. This change in production practices denotes a change in stockmanship competence. Result implies that in order to improve stockmanship competence which is reflected in farmer's production and management practices, increasing their knowledge and boosting their entrepreneurial motivation are significantly important.

Implication of farmer's knowledge on PMP related to gastro-intestinal parasites (GIP) in goat was also verified where results showed that there were differences and similarities in the production practices associated to the prevalence of parasite of farmers with and without training. Fecal test showed that Strongyle Type (ST) was the most common GIP found in the fecal samples of goats collected. Both groups have significant differences in the EPG and level of infestation of ST parasite. Provision of housing, complete stall feeding during rainy season, grazing goats in a common pasture area and provision of feeds and minerals were the production practices identified to have high significant influence on the EPG of ST worms.

This study has described a welfare assessment method that can serve as a starting point or reference for a sound goat welfare practice and has showed the implication of animal welfare on the productivity and profitability of backyard livestock production. In order to improve farmer's stockmanship competence, increasing the knowledge and boosting entrepreneurial motivation is significantly essential and this could be achieved through capacity development in the form of training. More research on animal welfare in backyard livestock operation could provide more information that can advance further discussion and develop new ideas on how to address animal welfare in the Philippines.

REFERENCES

ADM Alliance Nutrition, 2012. The goat guide. www.admani.com. Accessed on 13th October 2012.

Ajzen, I., 1885. From intentions to actions: A Theory of Planned Behavior. In: Kuhl, J., Beckman, J. (Eds.), Action control: From cognition to behavior. 11-39.

Albright, J., 1987. Human-farm animal relationship. Advances in Animal Welfare Science, 3, 51-66.

Alo, M., 2004. Philippine Council for Agriculture, Fishery and Natural Resources Research and Development (PCARRD) on her lecture on "How to Conduct Farmer Livestock School on Inteagrated Goat Management". Training of Trainers. October 2004, CLSU, Nueva Ecija. Philippines.

Alo, M. and Saithanoo, S., 2006A. Beyond worm control in small ruminants:A cross-country assessment of impact of ILRI-IFAD TAG 443 in Vietnam, Indonesia and the Philippines. http://www.mekarn.org/procsr/alo.pdf. Accessed on 3rd January 2013.

American Veterinary Medical Association, 2013. What is animal welfare. https://www.avma.org/KB/Resources/Reference/AnimalWelfare/Pages/what-is-animal-welfare.aspx. Accessed on 3rd March 2013.

AndreaSmidt, D. U., 1982. Behavioural alteration in young cattle on slatted floors. Hohenheimer Arbeiten, 121, 51-60.

AWRG, 2012. Animal welfare reaction group: What is animal welfare. http://www.animalwelfarereaction.org/. Accessed on 30th May 2012.

Asian Development Bank (ADB), 2003. Participatory livestock development project. http://www.adb.org/documents/bangladesh-second-participatory-livestock-development-project. Accessed on 10th January 2013

Ayoub, M.A. and Saleh, A.A., 1998. A comparative physiological study between camels and goats during water deprevation. Emirates Journal Agricultural Science, 10 (2), 44-60.

Bartussek, H., 1999. A review of the animal needs index for the assessment of animals' wellbeing in the housing systems for Austrian proprietary products and legislation. Livestock Production Science, 61, 179-192.

Bartussek, H., Leeb, C. and Held, S., 2000. Animal Needs Index For Cattle. Federal Research Institute for Agriculture in Alpine Regions BAL Gumpenstein, A8952 Irdning, http://www.bartussek.at/pdf/anicattle.pdf. Accessed on 20th March 2013.

Beaurue of Animal Statistics (BAS), 2013. Livestock production. http://countrystat. bas.gov.ph/. Accessed 1st and 25th January, 2012; 8th and 29 June, 2013.

Bekure, S. and Tilahun, N., 1983. Pastural system research in Sub-Saharan Africa. Livestock marketing studies.

Blood, D.C., Studdert, V. P. and Gay, C.C., 2007. Saunders Comprehensive Veterinary Dictionary. Elsevier Saunders. U.K.

BBCSS, 2006. Board on behavioral, cognitive and sensory sciences. Motivation and behavioral change: When I'm 64 34-53. National Academies Press.

Boivin, X., Boissy, A., Chupin, J.M and Le Neindre, P., 998. Herbivores, caretakers and range management. In: P.J. Goddard (Ed). Proceeding of the E.U. workshop on the implications of extensification for the health and welfare of the beef cattle and sheep. Concerted Action. AUIR 3-CT9-0947. , 43-50.

Bolger, J., 2000. Capacity Development: Why, what and how. CIDA Capacity development occasional paper. 1 No.1.

Bondoc, O., 2005. The Philippine goat breed registry in relation to genetic improvement and conservation. The Philippine Agricultural Scientist, 88 (2), 179-191.

Bousfield, B and Brown, R., 2010. Animal Welfare. Veterinary Bulletin: Agriculture, Fisheries and Conservation Department Newsletter, 1 (4).

Bracke, M., Spruijt, B. and Metz, J., 1999. Overall animal welfare assessment reviewed: Is it possible? Netherlands Journal of Agricultural Science, 47, 279-291.

Broom, B.M., 2011). A history of animal welfare science. Acta Biother, 59, 121-137.

Brooms, D.M., 1988. The scientific assessment of animal welfare. Applied Animal Behaviour, 20, 5-19.

Brown, J., 1985. Australian Centre for International Agricultural Research (ACIAR), Goat production and research in Fiji.

Brown, J. and Seddon, Y., 2014. Sow housing: Good welfare depends on good stockmanship. Pig Progress, http://www.pigprogress.net/Breeding/Housing/ 2014/1/Sow-housing-Good-welfare-depends-on-good-stockmanship-1426400W/. Accessed on 20th February 2014.

Burns, C., and Devendra, M., 1970. Goat Production in the Tropics. Commonwealth Agricultural Buruex (Farmham Royal).

Carenzi, C. and Verga, M., 2009. Animal Welfare: review of the scientific concept and definition. Italian Journal of Animal Science, 8, 21-30.

CLSU, 2013. Central Luzon State University. The goat industry in the Philippines. http://clsu.edu.ph/downloads/upload/130100%20The%20Goat%20Industry%20in%20the%20Philippines.pdf. Accessed on1st September 2013.

Collar, C., Foley, L., Glenn, J., Hullinger, P., Reed, B., Rowe, J. and Stull, C., 2000. Animal Care Series: Goat Care Practices. University of California, Davis; First Edition.

Collier, A., Cotterill, A., Everett, T., Muckle, R., Pike, T. and Vanstone, A., 2010. Understanding and Influencing Behavior: A Review of Social Research, Economics and Policy Making in Defra.

Cruz, E., 2004. Farmer Livestock School on Goat Management Manual: Potentials of goat raising in the Philippines. pp136-139.

DA, 2005. Department of Agriculture. Livestock Report RFU I.

DA, 2007. Annual Report of Department of Agriculture, Regional Field Unit I.

Davendra, C., 1999. Goats: Challenges for increase productivity and improved livelihoods. Outlook on Agriculture, 28 (4), 215-226.

Dawkins, M.S., 1990. From an animala's point of view: motivation, fitness and animal welfare. Behavioural Brain Science, 13, 1-31.

De Jonge F.H., Aarts, M.N.C., Steuten, C.D.M. and Goewie, E.A., 2000. Strategies to improve animal welfare through "good" stockmanship. The 4rth NAHWOA Workshop, Clemont-Ferrand, 38-42.

Department for Environment, Food and Rural Affairs (DEFRA), 2014. Animal Welfare assessment. http://www.organicvet.co.uk/VetMan/Welfare%20Assessment.htm. Accessed on 21st December 2014

DEFRA, Farm Animal Welfare Committee (FAWC), 2013. Five freedoms. http://www.defra.gov.uk/fawc/about/five-freedoms/#. Accessed on 24th of August 2013.

DEPI, 2001. Department of Environment and Primary Industries. Code of accepted farming practices for the welfare of goats. Bureau of Animal Welfare, http://www.dpi.vic.gov.au/agriculture/about-agriculture/legislation-regulation/animal-welfare-legislation/codes-of-practice-animal-welfare/accepted-farming-practice-goats. Accessed on 2nd of September 2013.

Diclemente, C., Bellino, L., Neavins, T., 1999. Motivation for Change and Alcoholism Treatment. Alcohol Research and Health, 23 (2), 86-92.

Dubeuf, J., Morand-Fehr, P. and Robino, R., 2004. Situation, changes and future of goat industry around the world.

Ducusin, R. and Faylon, P., 1996. Gastrointestinal Helminths of Small Ruminants in the Philippines. Sustainable Parasite Control in Small Ruminants, 128-133.

Duncan, I.J.H., 1993. Welfare is to do with what animals feel. Journal of Agricultural Environment Ethics 6 (Suppliment 2), 8-14.

Duncan, I.H., 2005. Science-based assessment of animal welfare: farm animals. Revue Scientifique et Technique International Office of Epizootics, 24 (2), 483-492.

Eduardo, S., 1986. Helminth parasites of ruminants in the Philippines and a guide to their identification (A terminal report). UPS-NSTA, Diliman, Quezon City, 250.

EFSA, 2012. European Food Safety Authority. Animal Welfare. http://www.efsa.europa.eu/en/tropic/animalwelfare.htm. Accessed on 2nd March 2012.

FADGC, 2012. Proceeding of First Asia Dairy Goat Congress. http://www.fao.org/docrep/017/i2891e/i2891e00.pdf. Accessed on 16th of January 2014.

FAO, 2012. Food and Agriculture. Promoting animal welfare through proper nutrition. http://www.fao.org/ag/againfo/home/en/news_archive/2012_Promoting_animal_welfare_through_proper_animal_nutrition.html. Accessed on 10th of October 2013

FAO, 2002. Biological control of nematode parasites of small ruminants in Asia: Final proceedings of FAO technical co-operation project in Malaysia TCP/MAL/0065Animal production and health paper. FAO-UN, Rome, Italy.

FAO, 2008. Capacity building to implement good animal welfare practices. http://www.fao.org/fileadmin/user_upload/animalwelfare/AW_Exp-meeting_EN_1.pdf. Accessed on 23rd of October 2013.

FAO, 1981. Economic Constraints of Goat and Sheep Production in Developing Countries. FAO Corporate Documentary Repository. http://www.fao.org/docrep/009/ah221e/AH221E13.htm. Accessed on 5th of August 2013.

Gura, S., 2008. Industrial livestock production and its impact on smallholders in developing countries. Consultancy report to the League for Pastoral Peoples and Endogenous Livestock Development (www.pastoralpeoples.org), Gmany.

FAO, 1988. Farm structures in tropical climates: A textbook for structural engineering and design. Agriculture and Consumer Protection, Rome.

FAO, 2009. Livestock in Balance. The State of Food and Agriculture of the United Nations, Rome Italy. 3-33.

Wilson, T., 1991. Small ruminant production and small ruminant genetic resource in the tropics. Publications Division, Food and Agriculture, Organization of the United Nations, Via delle Terme di Caracalla, 00100 Rome, Italy. 8-30.

FAWC, 2007. Farm Animal Welfare Council. Report on stockmanship and farm animal welfare. Role and scope of stockmanship. FAWC, London, U.K. 7-17.

FAWC, 1992. Farm Animal Welfare Council: FAWC updates the five freedoms. Veterinary Record, 131, 357.

Fears, R., 2014. Good stockmanship requires the right attitude. Progressive Cattleman magazine, http://www.progressivecattle.com/focus-topics/herd-health/6304-good-stockmanship-requires-the-right-attitude. Accessed on 26th June 2014.

FFTC, 2008. Food and Fertilizer Technology Center. Working for the competitiveness of goat production in Asia. http://www.fftc.agnet.org/news.php?func=view&id=20110714223812. Accessed on 17th

Fraser, D., Weary, D.M., Pajor, E.A. and Milligan, B.M., 1997. A scienfific concept of animal welfare that reflects ethical concerns. Animal Welfare, 6, 187-205.

Freeman, J., Ambadly, N., Midgley, K. and Holcomb, P., 2011. The real-time link between person perception and action: Brain potential evidence for dynamic continuity. Social Neuroscience, 6 (2), 139-155.

Graham, D., 2012. What is the meaning of motivation. http://ezinearticles.com/?What-is-the-Meaning-of-Motivation?&id=4326473. Accessed on 10th June 2012.

Gura, S., 2008. Industrial livestock production and its impact on smallholders in developing countries. Consultancy report to the League for Pastoral Peoples and Endogenous Livestock Development, 6.

Hanna, D., Sneddon, I.A., Beattie, V.E., 2009. The relationship between the stockperson's personality and attitudes and the productivity of dairy cows. Animal, 3, 737-743.

Harrison, R, 1964. Animal Machine. Oxfordshire, U.K: Vincent Stuart Publishers Ltd.

Hemsworth, P. H. and Coleman, G. J., 1998. Human-livestock interactions: The stockperson and the productivity and welfare of intensively farmed animals. CAB International, New York, NY, USA.

Hemsworth, P.H., 2008. Stockmanship makes a difference. Processdings of the North Carolina Health Hogs Seminar, http://www.ncsu.edu/project/swine_extension/healthyhogs/book2000/hemsworth.htm. Accessed on 4th October 2013.

Hemsworth, P.H., Barnett, J. L., Coleman, G.J., Hansen, C., 1989. A study of the relationships between the attitudinal and behavioural profiles of stockpersons and the level of fear of humans and repoductive performance of cmmercial pigs. Applied Animal Behaviour Science, 23, 301-314.

Hemsworth, P.H. and Coleman, G. P., 1998. Human-livestock interactions: The stockperson and the productivity and welfare of intensively-farmed animals. CAB International, Oxon UK.

Hewson, C.J., 2003. What is animal welfare? Common definitions and their practical consequences. The Canadian Veterinary Journal, 44 (6), 496-499.

Hibbard, W., 2013. Defining stockmanship. Stockmanship Journal, http://stockmanshipjournal.com/defining-stockmanship/. Accessed on 3rd September 2013.

Horning, B., 2001. The assessment of housing conditions of dairy cows in littered loose housing system using scoring methods. Acta Agriculturae Scandinavica Section A - Animal Science Supplement, 30, 42-47.

Hutchings, J. Gordon, I., Robertson, E., Kyriazakis, I. and Jackson, F.M.R., 2000. Effects of parasitic status and level of feeding motivation on the diet selected by sheep grazing grass/cover swards. Journal of Agricultural Science, 135, 65-75.

IFAD, 2014. International Fund for Agricultural Development. Rural poverty in the Philippines. http://www.ruralpovertyportal.org/country/home/tags/philippines, Accessed on 20th May 2014.

Jabbar, M., 1998. Buyer preferences for sheep and goats in Southern Nigeria: A hedonic price analysis. www.sciencedirect.com. Accessed 10 July 2006.

Johnsen, P.E, Johnnesson, T and Sandoe, P., 2001. Assessment of Farm Animal Welfare at herd Level: Many Goals, Many Methods. Acta Agriculture Scaninavica Animal Science Supplement, 30, 26-33.

Judge, T., Thoresen, C., Bono, J. and Patton, J., 2001. Job satisfaction-Job performance relationship: A qualitative and quantitative review. Psyco Bull, 127 (3), 376-407.

Kauppinen, T., Vesala, K.M., Valros, A., 2012. Farmer attitude toward improvement of animal welfare is correlated with piglet production parameters. Livestock Science, 143, 142-150.

Lawler, E. and L. Porter 2008. The Effect of Performance on Job Satisfaction, Industrial Relations: Journal of Economy and Society. 7 (1): 20-28.

Leaver, J., 1999. Dairy Cattle: Management and welfare of farm animals, The UFAW Handbook, Ewbank, R., F Kim-Madslien and C.B. Hart (Eds.) 4th Edition, UF AW, Wheathampstead, U.K., pp 17-47.

Lensink, B. J., Veissier, I. and Florand, L., 2001a. Farmers'influence on claves' behavior, health and production of a veal unit. Animal Scinece, 72, 105-116.

Lensink, B. J., 2002. The human-animal relationship in animal production. First Virtual Global Conference on Organic Beef Cattle Production, http://www.cpap.embrapa.br/agencia/congressovirtual/pdf/ingles/02en04.pdf. Accessed on 23rd October 2013.

Livestock Development Council (LDC), 2012. Tips on goat raising. http://ldc.da.gov.ph/pdf_files/Brochures/goat.pdf. Accessed April 2, 2012.

Loretz, C., B. Wechsler, R. Hauser, and P. Rusch. 2004. A comparison of space requirements of horned and hornless goats at the feed barrier and in the lying area. Appl. Anim. Behav. Sci. 87:275-283.

Losinger, W.C. and Heinrichs, A.J. (1997). Management practices associated with high mortality among preweaned dairy heifers. Journal of Dairy Research, 64, 1-11.

Lund, V., Coleman, G., Gunnarsson, S., Appleby, M.C and Karkinen, K., 2006. Animal welfare science-Working at the interface between the natural and social sciences. Applied Animal Behavioural Science, 97, 37-49.

Matias, J., 2014. Animal Welfare and Behaviour: Issues and initiatives in the Philippines. Paper presented in the course ANSC 430A/530A, Graduate Seminar in Animal Welfare. Faculty of Agricultural Sciences, The University of British Columbia, Vancouver, Canada, http://www.angelfire.com/ok2/ animalwelfare/initiatives.html. Accessed on 9th February 2014.

Metre Van, D., 2010. Gastrointestinal parasites in sheep and goat: Frequently asked questions. Livestock Series Fact Sheet. Colorado State University, Fact sheet number 8.019.

Miller, J., 2014. Internal and external parasites of goats. http://www.luresext. edu/goats/training/parasites.pdf. Accessed on 12th of March 2014.

Millman, J., Duncan, I., Stauffacher, M. and Stookey, J., 2004. The impact of applied ethologists and the International Society for Applied Ethnology in improving animal welfare. Applied Animal Behavior Science, 86, 299-311.

Napolitano, F., M. Caroprese, A. Girolami, R. Marino, A. Muscio, and A. Sevi. 2006. Effects of early maternal separation of lambs and rearing with minimal and maximal human contact on meat quality. Meat Science, 72, 635-640.

Network for Animal Health and Welfare in Organic Agriculture (NAHWOA). 2000. Human-animal relationship: Stockmanship and housing in organic livestock systems. Proceedings of the 3rd NAHWOA workshop. 21-24 October, 2000. Clermont-Ferrand, France.

Newton, N., 2010. Exploring Qualitative Methods: The use of semi-structured interview.

National Statistical Coordination Board (NSCB), 2006. Poverty statistics data http://www.nscb.gov.ph/. Accessed on 10th of April 2012.

OECD, 2006. The Challenges of Capacity Development: Working towards good practice. A DAC Reference Document. 3-7, 11-15.

Oludimu, O., 2012. Management of the West African dwarf goat in the humid tropics: A socioeconomic appraisal of feeding regimes. http://www.fao.org/wairdocs/ilri/x5519b/x5519b1i.htm. Accessed on 11th October 2012.

Organicvet UK, 2007. Animal Welfare Assessment. http://www.organicvet.co.uk/. Accessed on 11th April 2013.

Otoo, S., Agapitova, N., Behrens, J., 2009. The capacity development result framework: A strategic and results-oriented approach to learning for capacity development. World Bank.

Park, M. and Singer, P., 2012. The globalization of animal welfare. Foreign Affairs, 91 (2), 122-133.

Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (PCCARD), 2005. Philippine recommend on goat production. Pfizer, Inc., Los Banos, Laguna, Philippines.

Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (PCCARD), 2004. Facilitators' Guide to Farmer Livestock School on Integrated Goat Management. Department of Science and Technology. Los Banos, Laguna, Philippines.

Peacock, C.P., 1996. Improving goat production in the tropics: A manual for development workers. Oxfam/Farm-Africa Publication, 171-177.

Penrose, E., 1959. The theory of growth of the firmbasil, blackwell and mott. Oxford. http://organizationsandmarkets.files.wordpress.com/2009/10/kor.pdf. Accessed on 25th of October, 2012.

Quinones, M.A., 1997. 'Contextual influences on training effectiveness', in M.A. Quinones and A. Ehrenstein (eds), Training for a Rapidly Changing Workforce: Application of Psychological Research. 177-201.

Randolph, T. F, Schelling, E., Grace, D., Nicholson, C.F., Leroy, J. L, Cole, D. C., Demment, M. W., Omore, A and Zinsstaq A., 2007. Role of livestock in human nutrition and health for poverty reduction in developing countries. Journal of Anaimal Science, 85, 2788-2800.

Rassu , S.P.G., Enne, G., Ligios, S. and Molle, G., 2004. Nutrition and Reproduction In: G. Pulina (ed). Dairy Sheep Nutrition. CABI Publishing, Wallingford, U.K, 109-128.

Reynolds, M., 2014. Internal parasites: Detect, diagnose and destroy these debilitating enemies. Dairy Goat Journal, http://www.dairygoatjournal.com/91-2/internal_parasites_detect_diagnose_and_destroy_these_debilitating_enemies/. Accessed on 24th March 2014.

Rushen, J. and De Passille, A.M., 1992. The scientific assessment of the impact of Housing on animal welfare: A critical review. Canadian Journal of Animal Science, 72, 721-743.

Rushen, J. and De Passille, A.M., 2010. The Importance of Good Stockmanship and its benefits for the Animals. Improving Animal Welfare: A practical approach, 50-65.

Sebei, P. J., McCrindle, C.M and Webb, E.C., 2004. An economic analysis of communal goat production. J. S. Afr. Vet. Assoc. 75:19-23.

Segal, C. 2006. Motivation, test scores and economic success. http://www.econ.upf. edu/docs/papers/ downloads/1124.pdf. Accessed on 22nd of November 2012.

Serna, E., 2010. Livestock technician. Field survey interview

Sevi, A., 2005. Influence of sunlight, temperature and environment on the fatty acid composition and coagulatine properties of sheep milk. The Future of the Sheep and Goat Dairy Sectors. Special Issue No. 200501/2005. International Dairy Federation. University of Wisconsin, Madison, U.S. City, Country. pp. 305-311.

Sevi, A., L. Taibi, A. Muscio, S. Dell' Aquila, and D. Casamassima. 1998. Quality of ewe milk yield as affected by number of lambs and length of suckling. Ital. J. Food Sci.10:229-242.

Sevi, A., D. Casamassima, Pulina, G. and Pazzona A., 2009. Factors of welfare reduction in dairy sheep and goats. Ital. J. Anim. Sci. 8:81-101.

Sevi, A., S. Massa, G. Annichiarico, S. Dell'Aquila, and A. Muscio. 1999a. Effects of stocking density on ewes milk yield and incidence of subclinical mastitis. Journal of Dairy Research. 66: 489-499.

Scott, E.M, Nolan, A.M. and Fitzpatrick, L. 2001. Conceptual and methodological issues related to welfare assessment framework for measurement. Acta Agriculturae Scandinavica, Animal Science Supplement, 30, 5-10.

Sinkula, M., Baker, W and Noordewier, T., 1997. A Framework for Market-Based Organizational Learning: Linking Values, Knowledge, and Behavior. Journal of the Academy of Marketing Science. 25 (4): 305-318.

Smart, M. 2010. Goat production manual: A practical guide. 2nd Edition. iUniverse, Inc., Bloomington, NY, USA.

Sorensen, J. and Sandoe, P., 2001. Preface. Acta Agriculturae Scandinavica. Animal Science Supplement 30, 3-4.

Stevenson, M., Stokes, A., McNeal, L., 2012. An Introduction to Sheep and Goat Parasite Management in Hawaii. Livestock Management, 24, 1-9.

Tan, J. 2000. Goat production in the countryside. Agribusiness Magazine, Metro Manila, Philippines. 11. p.

Thorpe, W.H., 1965. The assessment of pain and distress in animals. Appendix III in report of the technical committee to enquire into the welfare of animals kept under intensive husbandry conditions, F.W.R. Brambell (chairman). H.M.S.O., London.

Tritschler, J and Master, B., 1998. Livestock fecal examination for parasite eggs. http://www.hawaii.edu/ansc/Old/Proceed/Hhl/peggs.htm. Accessed on 17th of February 2014.

Villar, E., 2004. Manual: Trainer's training on Farmer Livestock School on Integrated Goat Management, CLSU, Nueva Ecija. p. 8.

Weirenga, H. 1987. Behavioural problems in fattening bulls. In: Welfare aspects of Housing systems for veal and fattening bulls (Eds. M. C. Schlichting and D. Smidt). Proc.EU Seminar, September 16-17, 1987; Mariensee, Germany.

Wemelsfelder, F., 2000. Qualitative welfare assessment: Reading the behavioural expressions of pigs. 4th NAHWOA Workshop, Clemont-Ferrand, 20-30.

Zulkifli, I., 2013. Review of human-animal interactions and their impact on animal productivity and welfare. Journal of Animal Science and Biotechnology, 4:25.

ACKNOWLEDGEMENT

I would like to express my heartfelt appreciation and gratitude to all the persons who and institutions that were instrumental in the completion and success of my study and research.

Foremost, to Associate Professor Kasumi Ito, my kindhearted academic adviser, for her guidance, valuable insights and unending support throughout the completion of my study; Professor Kei-Ichiro Maeda, my mentor from The University of Tokyo, for his words of encouragement and high credence in my work which helped boost my confidence; Professor Akira Yamauchi for always visiting and making it sure that I have no problem; and to all the professors and students (past and present) in the division of International Cooperation Center for Agricultural Education (ICCAE) namely: Prof. Shuichi Asanuma, Asst Prof. Yoshiaki Inukai, Asst Prof. Daigo Makihara, Yamane, Nataka, Kakehashi, Kikuta, Daniel, Wainaina, Shibata, Matsukawa, Nam, Hamano and Nona for their constructive comments, rational suggestions and critics that helped me improved my research. Likewise, I thank them for the fun memories, their warm and close friendship which made my student life easy and in high spirit all the time. Special thanks to ICCAE's administrative staff specifically Mori san for the fun memories, Sousa for helping fix my IT related problems and Nanae san for always being so helpful and accommodating in so many ways.

To the Ministry of Education, Culture, Sports, Science and Technology- Japan for the opportunity to study in a leading academic institution and by sufficiently providing for my academic and living needs in Japan.

To Dr. Valentino Perdido, the Regional Executive Director of the Department of Agriculture Regional Field Unit I, for allowing me to carry out my PhD study. Special thanks to Mr. Joanthan C. Bugaoan, Dr. Annie Bares, Dr. Paz. Mones, Engr. Eduardo Gonzales, Maám Rosalia Pastor, ate Nelie and all the staff of the Livestock Section for the fun moments, support and encouragement whenever I am in the Philippines for my data gathering. Special thanks also to the five Local Government Units (LGUs) most especially to their Municipal Agricultural Officer (MAO) and Livestock Technicians for their valuable help and assistance in making the survey

interview smooth and successful. Without their support and cooperation, data gathering would have been so difficult. Sincere appreciation also to all the respondents from Tagudin, Pugo, Bani, Mabini, Alaminos City, San Fernando City and Salcedo for their valuable time and effort in attending the interview and allowing their goats to be taken fecal samples.

To all the members of the Nagoya Filipino Student Organization for all the fun and excitements. Special thanks to my ever best friends namely Heidi, Junie, Mundo, Randy, Kuya Lems and Ate Joyce for painting and making my life in Japan memorable and enjoyable. I can't thank you guys enough. To sis Emay, Lovely and Donna for their time and effort in editing my papers, you guys are the best. Likewise, to Ogawa sensei for the warm friendship and dental services.

To my loving parents, brothers, sister and cousins who have always been very understanding and supportive both spiritually and emotionally.

And above all, I want to give my heartfelt gratitude to our Almighty God for the unconditional love, wisdom, good health, guidance, protection, strength, solitude and grace. All praise and glory to my Lord and Savior Jesus.

The Author

APPENDICES

Questionnaires Used for Data Gathering

I. Demographic Profile of Respondents

Please answer the questionnaire to the best of your ability. Be assured that the information gathered will be reported in and will only be used for research. It will be a great help not to have any questions unanswered.

1. Name: _____
2. Home Address:_____
3. Age: _____4. Sex: _____ 5. Civil status_____
4. Highest Educational Attainment

    _____ Elementary

    _____ High School

    _____ College_____Degree _____Specialization

5. Dialects Spoken

    _____ Ilocano

    _____ Tagalog

    _____ Ibaloy

    _____ Pangasinense

    _____ Others, please specify: _____

6. Religion

    _____ Roman Catholic

    _____ Protestant

    _____ Others, please specify: _____

7. Occupation

    _____ Farmer

    _____ Trader

    _____ Businessman

    _____ Employee

    _____ Housekeeper

_____ Others, please specify:_____

8. How much is your annual income _____.

10. How many children is there in the family_____. Pls. identify the age of your children from eldest to youngest. _____.

II. Bio-physical characteristics

1. Climate
   - minimum temperature _____
   - maximum temperature _____
   - rainfall _____
2. Water availability
   - Sources _____
   - Seasonal distribution _____
3. Cropping patterns _____
4. Length of growing period
   - Rice _____
   - Other crops _____
5. Major crop-animal production systems _____
6. Proportion of farmland to total arable land _____
7. Non-farm activities prevalent in the area _____

III. Technical knowhow/background/Capacity

1. What type of ruminant animals do you raise; how many heads and how long have you been raising them?

Animal	No. of heads	No. of years raising	In charge of raising in the family
Goat			

2. When did you started raising goat and why? _____

3. What type of housing you have for your animals?

_____ temporary (nipa & bamboo)

_____ semi-permanent (wood and galvanized iron)

_____ permanent (cement, wood and galvanized iron)

4. Is the housing elevated?

_____ yes _____no. If yes why? _____

5. Is there a drainage canal for the animals?_____ yes _____ no
6. If the housing is elevated, is the flooring slatted? ____yes _____no
7. If the housing is elevated, what is the measurement from the ground to the floor of your animal's house? _____
8. What is the estimate measurement from the flooring to the roof of your animals house?_____
9. Is there separation/divider of your housing for the buck and adult and kids?

Feeding

10. What system of feeding management do you practice?

_____ grazing in a common field

_____grazing in own land

_____ Semi-Confinement

_____ Confinement

_____ tethering

11. Do you have a pasture area for your animals? _____Yes _____ No

11. If Yes, pls. specify the approximate size of your pasture area?_____
12. Pls. specify the kind of forage/grass planted in your pasture area?

_____

13. If no pasture area, where do you usually get the forages for your animals?

    _____

14. Are you providing supplements (vitamin and mineral) to your animals?_____ yes _____no.

If yes, specify what kind/type of supplement you are giving, _____

If no, why? _____

15. What time of the day do you pasture your animals or what time of the day do you let your animals graze?_____

16. Do you know the percentage ration of grass and legumes you are feeding to your animals? _____

17. How many kilogram of forage are you giving your animals in a day per head to increase its productivity? _____

18. Are you letting your animals graze even it is slightly raining? _____

Breeding

19. What system of breeding do you practice?

_____ cross breeding _____ inbreeding_____ upgrading

11. What are the breeds of goat in the farm? _____

    Source of your breeders? _____

12. Initial stock?

    Native_____

    Crossed breed _____

    Pure breed _____

13. Do you raise your own breeder buck? Yes _____ No _____

If No, to whom do you breed your animals? _____

If Yes, a. what is your doe to buck ratio _____

    b. Source of breeder buck_____

13. At what age do you usually breed your animal? _____

14. What is the kidding rate of your animals per year?

_____ 1

_____ 1.5

_____ 2

15. What is the average kid per kidding? _____

16. Do you mix the male and female together in their housing? _____yes _____no

17. Have you ever practiced/experienced Artificial Insemination? _____yes _____no

Health

16. What are the common diseases/symptoms observed in your animal?

_____ ORF

_____ bloat

_____ Impaction

_____ Respiratory diseases

_____ diarrhea

_____ pink eye

_____ Others, please specify: _____

17. Do you consult a veterinarian/livestock inspector?

_____ Yes ____No. If no, why_____

18. How often?

_____ once a week

_____ once a year

_____ during occurrence of diseases

_____Others, please specify: _____

Other concerns

19. What are the problems in the production of your animals?

_____ insufficient feeds

_____ stunted growth

_____ occurrence of diseases and parasites

_____ high cost of production

_____ lack of market outlet

_____ insufficient pasture area

_____ lack of technical know how in production

_____ lack of breeder stocks

_____ others, please specify: _____

20. What other management practices do you practice? Please check.

_____ deworming _____dewormer used_____ how often

_____ Immunization/vaccination

_____ disinfection

_____ hoof trimming

_____ dipping to control external parasites

_____ disbudding/dehorning

_____ record keeping

_____ ear tagging

_____ castration

_____ others, pls specify

Waste Management

21. How often do you clean the goat shed?

_____ once a day

_____ twice a week

_____ thrice a week

_____ others, pls specify _____

22. How do you manage the manure of goats?

_____ throw in a pit

_____ throw in canals

_____ process as organic fertilizer

_____ others, pls. specify_____

Marketing

23. To whom do you dispose your products?

_____ wholesalers

_____ retailers

_____ direct to consumers

_____ Others, please specify:_____

24. What are the reasons of selling your animals? (multiple responses)

_____ tuition fee of children

_____ buy basic needs

_____ buy luxury items

_____ others, please specify: _____

25. What are your marketing problems? (multiple responses is allowed)

_____ lack of market information

_____ lack of transportation

_____ seasonality of demand

_____ others, please specify: _____

26. At what age and at what weight do you sell your animals?

AGE	WEIGHT
1-3 months	5-10 kg.
4-6 months	10-15 kg.
7- 9 months	16-20 kg.
10-12 months	21 and above
13 months and above	

27. In what form?

_____ live weight

_____ dressed weight

28. How do you estimate the price? Pls. rank according to most common practice.

_____ size

_____ weight

_____ age

_____Others, please specify: _____

29. How much is the existing price in your locality?

Liveweight dressed weight/kg_____

Less than 1,000 _____

1,000 – 1500 _____

1, 600 – 2,000 _____

above P 2,000_____

30. Kindly indicate the month of high and low production? Specify only one month.

_____ high production

_____ low production

31. How many heads do you sell in a year? _____

32. Access to market indicators, e.g. quality of roads and other infrastructure, distance to the nearest market for livestock and livestock products as well as production inputs?

Trainings/ Capacity building

33. Have you attended trainings/seminars on goat production. _____

34. If yes, how many times in a year? _____ Pls. identify the seminars, trainings attended_____

_____

_____

35. Who sponsored the training/seminar you have attended_____.
36. Have you heard about FLS-IGM? _____
37. If yes, to whom did you heard/know? _____
38. Why did you not attend? _____
39. In scale 1-10 (1- the least; 10- the highest) kindly rank the following according to the level of your knowhow.

Technical Knowhow	Rank
Feeds and feeding (nutrition)	
Forage Management	
Goat Diseases	
Prevention and Control of diseases	
Breeding Management	
Waste Management	
Marketing	
Housing	

40. Out of 100%, pls rate the following according to the level of your knowhow/understanding.

Technical Knowhow	Percentage (%)
Feeds and feeding (nutrition)	
Forage Management	
Goat Diseases	
Prevention and Control of diseases	
Breeding Management	
Waste Management	
Marketing	
Housing	

41. Over all, out of 100%, how knowledgeable are you in goat production?

Other Information:

1. Why are you raising goat? _____

2. Are there members in the family who attended trainings on goat production or studying animal science/ veterinary medicine? _____

3. If yes, is he/she helping/teaching you the proper way of raising goats? _____

4. If you have problem in your goat, whom do you usually ask for help?_____

5. Contribution of livestock to household income (%):

   - goat _____
   - swine _____
   - Cattle _____
   - Chicken _____
   - Carabao _____

6. Are you member or officer in any organization? If yes, pls specify .

7. How many hrs do you devote your time in the organization ?

8. Where or to whom do you usually get information about livestock activities, project?

9. In a year, how many heads of your goat die?

Specification	No. of heads/year
Kids	
Mature	
Breeders	

10. What is the average weight of your goat at 8 months? _____

Institutional characteristics

1. Access to R&D institutions engaged in livestock R&D and R&D facilities

2. Access to credit

3. Laboratory facilities

4. Education and health facilities

5. Farmers’ groups, cooperatives, non-government organizations

6. Marketing infrastructure

7. Presence of agricultural processing facilities including those for livestock products processing

Questionnaire For Stockmanship and Fecal Sample Collection

Name:_____

Pls put identification code of the feces collected for fecalysis_____

Age:_____ Gender_____

Address:_____

Highest educational attainment_____ Main occupation (ex. Farming)_____

Sources of income (ex. Rice production etc_____

Have you attended trainings on goat production – Yes/No? If yes pls identify the title of trainings_____

How many times you were able to attend trainings/seminar on goat production? Please select one

1. 1 training/seminar in a year
2. 2 trainings/seminar in a year
3. More than 3 trainings/seminar in a year

If you have problem on your animal, what will you do? You can check more than one.

1. Consult veterinarian/livestock technician
2. Cure it myself
3. Butcher the animal if it is mature
4. Do nothing

What are the symptoms/diseases you observed in your animals. You can check more than one.

1. Orf
2. Bloat
3. Diarrhea
4. Pink eye
5. Black leg
6. Lameness
7. stunted growth
8. lost of appetite
9. mastitis
10. Pneumonia
11. Coughing
12. Others. Pls identify _____

1. Housing SC

Please choose one answer only

1. Is your goat house waterlogged during rainy season?	a. very often b. often c. sometimes d. rarely e. never
2. Select the flooring design adopted in your goat housing	a. not elevated from ground and not cemented b. not elevated and cemented but provide stair-type elevated platform c. not elevated but floor is cemented d. elevated with slatted bamboo flooring d. not elevated but floor cemented with stair-type bamboo slatted elevated platforms e. elevated with slatted bamboo flooring and with stair-type elevated platforms
3. What is the estimated height from flooring to ceiling?	a. 1.25 meter b. 1.5meters c. 1.75 meters = 1 d. 2 meters e. >2 meters
4. What kind of ceiling used?	a. pure galvanized iron b. cogon/nipa
5. Is there provision of eaves extension?	a. none b. 25 meter c. .5 meter d. 75meters e. 1meter
6. Is there provision of sun and wind breakers at the side of housing?	a. no b. yes
7. What is the floor space provided per adult goat?	a. <.5 meter^2 b..5 meter^2 c. .75 meter^2 d. 1meter^2 e.1.25meters^2
8. Is there provision of fenced loafing area?	a. no b. yes
if yes	a. not cemented b. cemented
9. Is there provision of feeding trough/rack?	a. no b. yes
if yes	a. located inside the house b. located outside house

10. Do you provide clean water trough?	a. never b. rarely c. sometimes d. often e. very often
11. Is there separate rooms/partitions in the housing?	a. no partitions b. separate room for kidding area/lactating does only (1 room) c. separate room for kidding area/lactating does and weaned kids only (2 rooms) d. kidding area/lactating does, weaned kids and growers (3 rooms) e. kidding area/lactating does, weaned kids, growers and buck(4 rooms)
12. Do you provide brooder box?	a. no b. yes
13. When do you clean your goat's house?	a. when feces is accumulated b. when it starts to accumulate sometimes c. sometimes d. often e. very often

2. Feeding SC

Please choose one answer only

1. Do you practice complete confinement during rainy season?	a. never b. rarely c. sometimes d. often e. very often
2. What is the frequency of grazing your animal during rainy season?	a. never b. rarely c. sometimes d. often e. very often
3. Do you graze the animal early morning when dew still present?	a. very often b. often c. sometimes d. rarely e. never
4. Do you pasture the animal in a communal pature area?	very often = 0; often = 0.5; sometimes = 1 rarely = 1.5; never = 2
5. Do you think you satisfy the feed requirement per animal per day (4.5% body weight)?	a. never b. rarely c. sometimes d. often e. very often
6. Do you provide a mixture of different grass and legumes?	a. never b. rarely c. sometimes d. often e. very often
7. Do you grow of-season forage crops to avoid feed scarcity in dry season?	a. never b. rarely c. sometimes d. often e. very often
8. Do you for cut and carry, wilt the forage before feeding to your goats?	a. never b. rarely c. sometimes d. often e. very often
9. Do you provide feed supplement to lactating does, bucks?	a. never b. rarely c. sometimes d. often e. very often
10. Do you provide feed supplement in times of forage scarcity?	a. never b. rarely c. sometimes d. often e. very often
11. Do you provide mineral & vit. Supplements?	a. never b. rarely c. sometimes d. often e. very often
12. Do you provide UTRS and or silage?	a. never b. rarely c. sometimes d. often e. very often

13. Do you provide clean drinking water?

a. never b. rarely c. sometimes
d. often e. very often

3. Breeding SC

Please choose one answer only

1. What is your common breeding practice?	a. A.I b. inbreeding c. upgrading d. crossbreeding e. purebreeding
2. What is the estimate age of breeding your goat?	a. 5 mos b. 6 mos. c. 7 mos. d. 8mos. e. >=9 mos.
3. Do you separate mature male from female?	a. never b. rarely c. sometimes d. often e. very often
4. Do you practice stock selection?	a. never b. rarely c. sometimes d. often e. very often
5. Do you purchase breeder from accredited breeding farms?	a. never b. rarely c. sometimes d. often e. very often
6. How many times you service your yearling breeder buck a year?	a. >31services/yr b. 30-31 services/yr c. 28-29 services/yr d. 26-27 services/yr e. 24-25services/yr f. <=23 services/yr
7. Do you cross small does with big buck?	a. never b. rarely c. sometimes d. often e. very often
8. Do you introduce in-heat does to the buck and not the other way around	a. never b. rarely c. sometimes d. often e. very often

4. Health and Husbadry SC

Please choose one answer only

1. Do you practice strategic deworming?	a. never b. rarely c. sometimes d. often e. very often
2. Do you attend to your animal's need when sick? (provision of medicine,food,water, etc)	a. never b. rarely c. sometimes d. often e. very often
3. Do you assist weak does during kidding (dystocia)?	a. never b. rarely c. sometimes d. often e. very often
4. Do you separate sick animals from healthy ones?	a. never b. rarely c. sometimes d. often e. very often
5. Do you treat the wounds/injuries if they have?	a. never b. rarely c. sometimes d. often e. very often
6. Do you practice dis-budding?	a. never b. rarely c. sometimes d. often e. very often
7. Do you practice hoof-trimming when hoof too long?	a. never b. rarely c. sometimes d. often e. very often
8. What age of goat when you perform castration?	a. more than 10 weeks b. 9-10 weeks c. 7-8 weeks d. 5-6 weeks e. 3-4 weeks
if not expert, do you seek vet/technician assistance?	a. no b. yes
9. Do you practice disinfection if needed?	a. never b. rarely c. sometimes d. often e. very often

Productivity

1. Total heads of mature goats do you raise? _____
   Native_____
   Upgrade _____
   Crossbreed/purebred _____
2. Estimate mature weight of your goat (8months old)_____
3. Estimate heads of goat died due to diseases in a year_____

Income

1. How many heads of goat sold in a year? _____
2. How much did you sold your animal per head?_____

Market (pls check, multiple choices)

1. Middlemen (viajeros) _____
2. Neighbors _____
3. Walk in-buyers_____
4. Livestock auction market_____