



Stockmanship Competence and Its Relation to Productivity and Economic Profitability: The Context of Backyard Goat Production in the Philippines

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ABSTRACT: A stockperson has a significant influence on the productivity and welfare of his animals depending on his stockmanship competence. In this study, stockmanship competence (SC) is defined as the capacity of the stockperson to ensure the welfare of his animals by providing his animals' needs. The study was conducted to evaluate the SC of backyard goat raisers and examine its relationship to goat productivity and economic profitability. There were 101 respondents for this study who have all undertaken farmer livestock school on integrated goat management (FLS-IGM). Interview was conducted in Region I, Philippines on September 3 to 30, 2012 and March 4 to 17, 2013. Data on SC, goat productivity and farmer's income were gathered. Questions regarding SC were formulated based on the Philippine Recommendations for Goat Production and from other scientific literature. Housing, feeding, breeding and health and husbandry management were the indicators used in computing stockmanship competence index score (SCIS). Pearson correlation using Statistical Package for Social Science (SPSS) was carried out to analyse the relationship between SCIS, productivity and income. Based from the results of the study, a majority of the respondents raised native and upgraded goats. The computed mean SCIS before and after undergoing FLS-IGM were 38.52% and 75.81% respectively, a percentage difference of 65.23%. Both index scores resulted in significant differences in productivity and income. The median mature weight and mortality rate of goats before FLS-IGM was 14 kg and 30% respectively. After FLS-IGM, median mature weight was 19 kg and mortality rate decreased from 30% to 11.11%. Likewise, fewer goat diseases were observed by farmers who were able to undergo FLS-IGM. With regard to income, there was a 127.34% difference on the median net income derived by farmers. Result implies that improved SC could lead not only to increased productivity and income of backyard goat raisers but also to better animal welfare. (**Key Words:** Stockmanship Competence, Backyard Goat Production, Animal Welfare, Goat, Philippines)

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 (Walkden-Brown, 1985; FAO, 1990; Sebei et al., 2005) confirm goats' 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 treat 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.

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(2001c). 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 to achieve this, 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 (SC) 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 SC of farmers and that suitable livestock development policies and programs for its growth and development be formulated.

MATERIALS AND METHODS

Data gathering

Fieldwork was conducted between September 3 to 30, 2012 and March 4 to 17, 2013 in Ilocos Region of Northern Philippines. Farmer beneficiaries of the farmer livestock school on integrated goat management (FLS-IGM) which were conducted in the municipalities of Tagudin, Ilocos Sur, Pugo, La Union, Mabini, Bani and Alaminos City, Pangasinan, Philippines in 2007 were chosen respondents in this study. This livestock school project was chosen because this modality is considered the first season-long (28 weeks) training school of farmers in the Philippines that specifically focuses on the whole production and management of goat. This modality was designed specifically for farmers already raising or wanting to raise

goats. Technical lectures that cover all topics about housing, nutrition/feeding, breeding and health and husbandry management were given half-day, once a week to farmer participants by municipal livestock technicians, veterinarians from the provincial veterinary office and staff from the Department of Agriculture.

In coordination with the municipal agriculturist and livestock specialist concerned in each municipality, farmer beneficiaries of FLS-IGM were identified and a total 101 farmers were interviewed out of the 130 targeted beneficiaries. The reasons why 29 farmer beneficiaries were not able to participate in the interview were the following: i) attended family reunion, ii) went abroad, iii) visited relatives, iv) deceased, and v) have prior appointments. A group interview and a visit to farmers' goat farm for ocular inspection on their goat and goat housing facilities were made in Pugo and Mabini to verify farmers' answers. On the other hand, one-on-one interview with farmers in Tagudin, Bani and Alaminos City were conducted near the farmers' goat house. In this case, ocular inspection on goat housing was 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 filled in the answers of the farmers on the questionnaire for them. All questionnaires were collected after the group and individual interviews. The structured questionnaire that was prepared to gather information on farmers' SC was based on the Philippine Recommend for Goat Production (PCCARD, 2005), tips on goat raising (LDC, 2012) and some scientific literatures related to goat behavior and production (Burns and Devendra, 1970; Collar et al., 2000; Tan, 2000; Alo et al., 2006; Smart, 2010). The questionnaire consisted of variables pertaining to housing, feeding, breeding and health management practices of farmers before and after FLS-IGM. Secondary data needed were collected from the office of municipal agriculturist by interviewing the livestock technician about farmers' goat production practices and status of goat productivity before farmers underwent FLS-IGM. Available recorded data on the status of farmer's goat productivity before undergoing FLS-IGM were also collected. These were used to verify farmer's answers. The total maximum points a respondent could get for over-all stockmanship was +88 points. A higher score, means better SC because it signifies high probability of meeting the animal's needs or welfare. Productivity and income derived from goat production were likewise gathered during the interview.

Data analysis

Housing parameter was defined by a set of indicators for good housing based on literatures mentioned above. The same is true with feeding, breeding and health and

husbandry. The indicators were made up of set of variables that summed up information satisfying the needs of the animals. Similarly, each parameter was computed as the summation of raw score divided by the maximum highest score multiplied by 100. Stockmanship competence index score (SCIS) was computed using this equation:

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

Where n is a set of stockmanship parameter; 1 a specific indicator in n; X the index score of the ith indicator in n (housing, feeding, breeding and health and husbandry) and Y the total number of indicators. A score of 50% was considered neutral in this study, which means that it is neither low nor high. Computed SCIS lower than 50% then was interpreted as low SC while SCIS higher than 50% was interpreted as high SC.

After computing for the SCIS of farmers before and after FLS-IGM, t-test was performed using SPSS to determine if there was significant difference in the productivity and income between low and improved SCIS. Regression was used to determine which among the SC indicators have a significant impact to productivity. Pearson correlation analysis was also carried out to check the correlation between SCIS, goat's productivity and income.

RESULTS

Stockmanship competence index score before and after undergoing the farmer livestock school on integrated goat management

Table 1 shows the result of SCIS before and after undergoing FLS-IGM. It shows that the mean SCIS before FLS-IGM was 38.52% implying that the SC of goat raisers before FLS-IGM was low. Considering that stockmanship

can influence the welfare of the animal, result could also suggest that the goat's welfare was low before farmers have undergone FLS-IGM. On the other hand, SC after FLS-IGM was high at 75.81%, suggesting a 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.

Goat productivity and farmers' income in low and high stockmanship competence

Results showed that there was a significant difference on the productivity and farmer's income between low and high SC (Table 2). There was a 30.30 percentage difference (4.91 kg increase) in the median weight of goat at 8 months old and at the same time, the annual mortality and mortality rate had 40.00 and 91.89 percentage difference respectively, both decreased. Likewise, there was a percentage difference of 54.54 in the population of goats in the farm or 3 heads higher after farmers have undergone FLS-IGM where high SC was achieved. With regard to the annual median net income derived by farmers from goat production at constant price, result showed that there was 127.34 percentage difference between low and high SC. The increase of net income can be explained by the increased number of heads sold as a result of increase in the population of stocks in the farm. It can also be attributable to the increase of weight at 8 months old and decreased mortality rate. These suggests that high SC had contributed to the increased productivity and economic profitability of smallholder farmers while improving goat welfare.

Diseases/symptoms observed

Table 3 shows the diseases/symptoms observed by farmers on their animals before and after FLS-IGM. The

Table 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

FLS-IGM, the Farmer Livestock School on Integrated Goat Management; STD, standard deviation.

Table 2. Productivity and income in low and high stockmanship competence

Specifications	Low stockmanship competence (Median)	High stockmanship competence (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	Decreased
Annual mortality rate (%)	30.00	11.11	91.89	0.000	Decreased
Population of goat in the farm (hd)	4.00	7.00	54.54	0.000	Increased
Annual net income (P)	802.68	3,616.21	127.34	0.000	Increased

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

Diseases/symptoms 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, diarrhea, 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.

result showed that farmers with low SC have observed more diseases/symptoms on their animals. 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 had led to fewer occurrence of diseases/symptoms observed by the farmers on their goats.

Factors influencing goat productivity in terms of mature weight and mortality rate

Result of the regression analysis showed that housing, feeding and health and husbandry competence index scores have a significant influence on the mature weight of goat, with housing and health as the strongest predictor among the four parameters. Both have a p-value of 0.001 and with 0.312 and 0.316 coefficient respectively (Table 4). This means that a point increase in housing and health competence index score would result to 0.312 kg and 0.316 kg increase in mature weight. On mortality rate, results demonstrated that housing and health/husbandry competence index scores have significant influence over it, with housing index score having the highest influence

among the four parameters with -0.453 coefficient. This means that a point increase on housing competence index score would decrease the mortality rate by 0.453. Result of regression analysis also shows that both housing and health have significant influence on mature weight and mortality rate while breeding competence index score showed no influence on both.

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

Correlation between stockmanship competence, goat productivity and farmers' income

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 vice versa (Table 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.

DISCUSSION

Based on the data analyzed, it is evident that SC has a

Table 4. Factors influencing goat productivity in terms of mature weight and mortality rate

Stockmanship parameter index score	Productivity			
	Mature weight		Mortality rate	
	Unstandardized coefficient	p value	Unstandardized coefficient	p value
Housing competence index score	0.312	0.001	-0.453	0.000
Feeding competence index score	0.236	0.009	-0.116	0.171
Breeding competence index score	0.069	0.430	-0.116	0.051
Health and husbandry competence index score	0.316	0.001	-0.228	0.008
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

Table 5. Pearson correlation between stockmanship competence index scores, productivity and income

Specification	Low SCIS	High SCIS
Mature weight (8 mos old)	0.660**	0.469**
Mortality rate	-0.445**	-0.503**
Income	0.382**	0.540**

SCIS, stockmanship competence index score.

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

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 SC. This supports the 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 adaptable 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 SC 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 as 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 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 or not 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 SC where feeding practices were directed towards meeting the feeding requirements of goats.

Though native goats have higher resistance to diseases (Davendra, 1999), the importance of being aware of their health condition should not be ignored. Production and management practices of farmers oftentimes expose goats to injuries, lameness, endo and ecto-parasitic disease, bloat, 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 the goat's productivity and welfare. Similarly, there are instances where the goat needs care and assistance 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 tenderness (Napolitano et al., 2006).

Surprisingly, breeding competence in the study turned out to be insignificantly influential to mature weight and mortality rate despite the practice of upgrading by majority of the farmers. 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 ruminants 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 SC 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 SC 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.

CONCLUSION

Based from the results of the study, farmer's SC clearly demonstrated its importance in achieving higher goat productivity, profitability and welfare. Low SC 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 SC 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.

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REFERENCES

- Alo, A. and S. Saithanoo. 2006. 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 January 3, 2013.
- Andrea, U. and D. Smidt. 1982. Behavioural alteration in young cattle on slatted floors. *Hohenheimer Arbeiten* 121:51-60.
- Boivin, X., A. Boissy, J. M. Chupin, and P. Le Neindre. 1998. Herbivores, caretakers and range management. In: *Proceeding of the E.U. workshop on the implications of extensification for the health and welfare of the beef cattle and sheep* (Ed. P. J. Goddard). *Concerted Action. AU/R 3-CT9-0947*, 43-50.
- Bondoc, O. 2005. The Philippine goat breed registry in relation to genetic improvement and conservation. *Philipp. Agric. Sci.* 88:179-191.
- Bureau of Agriculture Statistics (BAS). 2010. Philippines. <http://www.bas.gov.ph/> Accessed December 20, 2010.
- Burns, M. and C. Devendra. 1970. *Goat Production in the Tropics*. Commonwealth Bureau of Animal Breeding and Genetics. Communication no. 19. Edinburgh, Scotland.
- Collar, C., L. Foley, J. Glenn, P. Hullinger, B. Reed, J. Rowe, and C. Stull. 2000. *Animal Care Series: Goat Care Practices*. First Edition. University of California, Davis CA, USA.
- Davendra, C. 1999. *Goats: Challenges for increased productivity*

- and improved livelihoods. *Outlook Agric.* 28:215-226.
- De Jonge, F. H., M. N. C. Aarts, C. M. Steuten, and E. A. Goewie. 2000. Strategies to improve animal welfare through "good" stockmanship. The 4th NAHWOA Workshop. 2000 October 21-24; Clermont-Ferrand, France. 38-42.
- EFSA. 2012. European Food Safety Authority. Animal Welfare. <http://www.efsa.europa.eu/en/tropic/animalwelfare.htm> Accessed March 2, 2012.
- FAWC (Farm Animal Welfare Council). 2007. Report on stockmanship and farm animal welfare. Role and scope of stockmanship. London, UK.
- Fears, R. 2014. Good stockmanship requires the right attitude. *Progressive Cattleman* magazine. <http://www.progressivecattle.com/focus-topics/herd-health/6304-goodstockmanship-requires-the-right-attitude>. Accessed June 26, 2014.
- Hemsworth, P. H. 2008. Stockmanship makes a difference. North Carolina Swine Veterinary Group. http://www.ncsu.edu/project/swine_extension/healthyhogs/book2000/hemsworth.htm. Accessed January 28, 2014.
- Hemsworth, P. H. and G. J. Coleman. 1998. Human-Livestock Interactions: The Stockperson and the Productivity and Welfare of Intensively Farmed Animals. CAB International, New York, NY, USA.
- Leaver, J. 1999. Dairy Cattle: Management and welfare of farm animals. The UFAW Handbook (Eds. R. Ewbank, F. Kim-Madslie, and C. B. Hart). 4th Edition, UFAW, Wheathampstead, UK. pp. 17-47.
- Lensink, B. J., I. Veissier, and L. Florand. 2001c. The farmer's influence on calves' behaviour, health and production of a veal unit. *Anim. Sci.* (in press).
- 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.
- 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 Sci.* 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.
- Oludimu, O. 1990. Management of the West African dwarf goat in the humid tropics: A socioeconomic appraisal of feeding regimes. <http://www.fao.org/wairdocs/ilri/x5519b/x5519bli.htm> Accessed October 11, 2012.
- PCCARD (Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development). 2005. Philippine recommend on goat production. Pfizer, Inc., Los Banos, Laguna, Philippines.
- Sebei, P. J., C. M. McCrindle, and E. C. Webb. 2004. An economic analysis of communal goat production. *J. S. Afr. Vet. Assoc.* 75:19-23.
- Sevi, A. 2005. Influence of sunlight, temperature and environment on the fatty acid composition and coagulative 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, WI, USA. pp. 305-311.
- Sevi, A., L. Taibi, A. Muscio, S. Dell'Aquila, and D. Casamassima. 1998. Quality of ewe milk as affected by number of lambs and length of suckling. *Ital. J. Food Sci.* 10:229-242.
- Sevi, A., D. Casamassima, G. Pulina, and A. Pazzona. 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. *J. Dairy Res.* 66:489-499.
- Smart, M. 2010. Goat production manual: A practical guide. 2nd Edition. iUniverse, Inc., Bloomington, NY, USA.
- Tan, J. 2000. Goat production in the countryside. *Agribusiness Magazine*, Metro Manila, Philippines. 11. p.
- Walkden-Brown, S. W. 1985. Goat production and research in Fiji. Goat Production and research in the tropics. Processing Series No. 7. Australian Centre for International Agricultural Research (ACIAR), 42-48.
- 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.