

Full Length Research Paper

Creating animal welfare assessment method for backyard goat production in the Philippines using stockmanship competence as proxy indicator

M. J. Alcedo^{1*}, K. Ito² and K. Maeda³

¹Graduate School of Bioagricultural Sciences, Nagoya University, Nagoya 464-8601, Japan.

²International Cooperation Center for Agricultural Education, Nagoya University, Nagoya 464-8601, Japan.

³Department of Veterinary Medical Sciences, the University of Tokyo, Tokyo 113-8654, Japan.

Received 1 May 2014; Accepted 17 September, 2014

Measuring animal welfare is a newly emerging area of research and it requires multi-disciplinary approach to achieve it. Due to the diversity of what constitute the definition of animal welfare, different methods and models have been suggested, and were mostly implemented in semi-intensive and commercial farms in developed countries. There are hardly any studies on animal welfare assessment conducted in backyard livestock operations in developing countries. Recognizing that majority of livestock operations in the Philippines are categorized as backyard, it is crucial to come up with parameters that can assess the welfare of the animal at the backyard level. The current research used stockmanship competence as a proxy indicator in assessing animal welfare. Stockmanship competence in this study refers to the capacity of the animal owner to ensure the welfare of their animal by providing their needs for growth and reproduction. The Philippine recommendations on goat production, tips on goat raising and goat scientific literatures were used as the basis of identifying indicators known to be important in meeting the needs of the animal and ensuring its welfare. Scores from -1 to +2 were assigned depending on how close it is of satisfying the needs of the animal. It is hoped that this assessment method would contribute to the growing body of knowledge on animal welfare and could be utilized as a logical and scientific framework in assessing welfare not just in backyard goat operation but in semi-intensive and commercial goat operations. It is suggested that further studies be done to identify other factors and standardize indicators that would reflect a comprehensive outline for goat welfare.

Key words: Backyard goat production, stockmanship competence, animal welfare, Philippines.

INTRODUCTION

Assessing animal welfare 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

*Corresponding author. E-mail: lungayban2008@yahoo.com

Author(s) agree that this article remain permanently open access under the terms of the [Creative Commons Attribution License 4.0 International License](https://creativecommons.org/licenses/by/4.0/)

appropriate methods in gathering data 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 Fraser et al. (1997), one comprehensive approach to animal welfare assessment is measuring the health, productivity, feeling, 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. As of this moment, 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 referred 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 stockmanship 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) (2012) and other welfare organizations have recognized 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 steps taken by animal owners to prevent animal suffering or unsatisfactory living conditions (AWR Org, 2012), the current study took the path of highlighting 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. Likewise, hardly any research dealing with animal welfare at the backyard goat production can be found at present. 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.

Animal welfare in the Philippines

Animal welfare is still new in the Philippines. 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. 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, 2014). Government agencies have also started to raise awareness and understanding on animal welfare, however, assessment method for production animals is still lacking and not in place. Continuous research for the development of welfare assessment standards and

methods are deemed necessary in order to come up with a clear-cut policy and programs from different stakeholders involved.

Stockmanship competence as proxy indicator for animal welfare assessment

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. Past researches, particularly in the pig industry has shown that interactions between stockperson and their animals can limit the productivity and welfare of livestock [Hemsworth and Coleman, 1998]. 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 in 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 the productivity and welfare of farm animals. It can be argued, in this case, that the deficiency of farmer's capacity on proper stockmanship could mean deficiency in welfare and vice versa. This can be used as an indicator in assessing animal welfare most especially in backyard livestock operations. Stockmanship as proxy indicator for assessing the welfare of the animal 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.

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 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 develop 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.

METHODOLOGY

Backyard goat production as the case study

Basically, livestock farming in the Philippines is categorized as a backyard farming having few numbers of livestock per household such as goats where 98% of the total goat population is backyard operated (BAS, 2010). Goat production has been part of farmers' farm activities to augment their income and for food security since time immemorial. Compared with other farm animals, goat production has the lowest financial input because of their size and ability to survive under marginal farm inputs. However, despite the potential of goat raising as a viable enterprise, total production and value have been one of the lowest in the livestock sector (CLSU, 2013). In order for the goat industry to enhance the livelihood of farmers, research and development should continuously be able to come up with idea and innovation that can lead to its development. Hence, this study chose backyard goat production for the development of welfare assessment method.

Goat stockmanship parameters and indicators used

In order to be guided on what welfare indicators were needed for evaluating stockmanship, 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 (Alo and Aithanoo, 2006; Collar et al., 2000; Smart, 2010) were used as references in creating stockmanship competence assessment indicators. The study had 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 animals to be susceptible to diseases and gastro-intestinal parasites, thus compromising their welfare. There is a large body of literatures 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 has 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 8 months 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 or those that are likely to occur in a 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 anaesthesia 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 to 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 do. However, based on scientific literatures, they are considered as pre-requisite for good welfare.

Stockmanship competence parameter validation

Fieldwork was conducted to validate stockmanship competence indicators from September 3 to 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 1 h and 22 min. This implies that the process does not require too much time for both the farmer and researcher.

RESULTS AND DISCUSSION

Scoring of stockmanship competence indicators

The assessment adopts 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 (Tables 1 and 2) while breeding and health have 16 and 20, respectively (Tables 3 and 4). Though they have different scores, each component is treated with the same weight because there is no research undertaken in identifying 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.

Method of computing stockmanship competence index score

Housing, feeding, breeding and health assume equal weights as previously stated. 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) will then be calculated using the following:

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

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

Table 1. Indicators of stockmanship 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 platforms = 2
Height from floor to ceiling provided	1.25 m = 0; 1.5 m = .5; 1.75 m = 1; 2 m = 1.5; >2 m = 2
Ceiling used	Pure galvanized iron = 1; cogon/nipa = 2
Provision of eaves extension	None = 0; 0.25 m = 0.5; .5 m = 1; 0.75 m = 1.5; 1 m = 2
Provision of sun and wind breakers at the side of housing	No = 0; Yes = 1
Floor space provided per adult goat	<.5 m ² = 0; .5 m ² = 0.5; .75 m ² = 1; 1 m ² = 1.5; >=1.25 m ² = 2
Provision of fenced loafing area	No = 0; Yes = 2
If yes	Not cemented = 0; Cemented = 1
Provision of feeding trough/rack	No = 0; Yes = 2
If yes	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 accumulate = 0; Sometimes = 1; Often = 1.5; Very often = 2

Table 2. Indicators of stockmanship 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 pasture 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 and vitamin 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 3. Indicators of stockmanship and scores for breeding competence.

Production and management practices	Score
Breeding competence (maximum range of scores = 16)	
Very common breeding practice	A.I = -1; inbreeding = 0.5; upgrading = 2; crossbreeding = 2; pure breeding = 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	>31 services/year =-1; 30-31 services year=0; 28-29 services/year=0.5; 26-27 services year=1; 24-25 services year=1.5; <23 services year=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 4. Indicators of stockmanship 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 = 0.5; 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 = 0.5; often = 1.5; very often = 2
Practice hoof-trimming when hoof too long	Never = -1; rarely = 0; sometimes = 0.5; 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

(housing, feeding, breeding and health and husbandry) and Y the total number of indicators.

Conclusion

Assessing animal welfare is a multi-disciplinary 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 an insight and understanding for appropriate decision making.

There are currently different approaches on how to

assess animal welfare but were 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 area. The study can be used to characterize or determine the welfare of goats and result 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.

ACKNOWLEDGEMENTS

The authors thank Nagoya University, Japan for financing the field data gathering and the Department of Agriculture RFU I, the Philippines and Local Government Agencies concerned for allowing the author to pursue the research study.

Conflict of Interest

The authors have not declared any conflict of interest.

REFERENCES

- Albright J (1987). Human-farm animal relationship. *Adv. Anim. Welf. Sci.* 3:51-66.
- Alo A, Saithanoo S (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.mekam.org/procsr/alo.pdf>. Accessed on 3rd January 2013.
- Animal Welfare Reaction Group (2012). <http://www.animalwelfareaction.org/>. Accessed on 30th May 2012.
- Ayoub AA, Saleh MA (1998). A comparative physiological study between camels and goats during water deprivation. *Emirates J. Agric. Sci.* 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. *Livest. Prod. Sci.* 61:179-192.
- Bartussek H, Leeb C, Held S (2000). Animal needs index for cattle Federal Research Institute for Agriculture in Alpine Regions BAL Gumpenstein, A8952 Irnding. <http://www.bartussek.at/pdf/anicattle.pdf>. Accessed on 20th March 2013.
- Brown J, 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
- Bureau of Agriculture Statistics (2010). Annual Report.
- Central Luzon State University (2013). The goat industry in the Philippines. <http://clsu.edu.ph/downloads/upload/130100%20The%20Goat%20Industry%20in%20the%20Philippines.pdf>, Accessed on 1st September 2013.
- Collar C, Foley L, Glenn J, Hullinger P, Reed B, Rowe J, Stull C (2000). *Animal Care Series: Goat care practices*. University of California, Davis; First Edition.
- De Jonge FHMC, Steuten CM, GoewieAarta EA (2000). Strategies to improve animal welfare through "good" stockmanship. The 4th NAHWOA Workshop, Clermont-Ferrand, pp. 38-42.
- Department for Environment, Food and Rural Affairs (DEFRA) (2013). *Farm Animal Welfare Committee (FAWC). Animal welfare assessment*. <http://www.organicvet.co.uk/VetMan/Welfare%20Assessment.htm>. Accessed on 21st December, 2013
- DEFRA, Farm Animal Welfare Committee (2013). Five freedoms. <http://www.defra.gov.uk/fawc/about/five-freedoms/#>. Accessed on 24th August 2013.
- Department of Environment and Primary Industries (DEPI) (2001). 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 3rd September 2013
- FAO (2012). http://www.fao.org/ag/againfo/home/en/news_archive/2012_Promoting_animal_welfare_through_proper_animal_nutrition.html. Accessed on 24th August 2013.
- FAO (1988). *Farm structures in tropical climates: A textbook for structural engineering and design*. Agriculture and consumer protection, Rome. <http://www.fao.org/docrep/015/i2433e/i2433e.pdf>. Accessed on 24th August 2013.
- FAWC (2012). Five freedoms. <http://www.fawc.org.uk/freedoms.htm> Accessed on 3rd November 2012.
- Fraser D, Weary DM, Pajor EA, Milligan BN (1997). A scientific concept of animal welfare that reflects ethical concerns. *Anim. Welf.* 6:187-205.
- Hemsworth PH, Coleman GJ (1998). *Human-livestock interactions: The stockperson and the productivity and welfare of intensively farmed animals*. CAB International, New York, NY, USA.
- Hibbard W (2013). Defining stockmanship. *Stockmanship J.* <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 – Anim. Sci. Suppl.* 30:42-47.
- Hutchings MR, Gordon IJ, Robertson E, Kyriazakis I, Jackson F (2000). Effects of parasitic status and level of feeding motivation on the diet selected by sheep grazing grass/cover swards. *J. Agric. Sci.* 135:65-75.
- Johnsen PE, Johnsson T, Sandoe P (2001). Assessment of Farm Animal Welfare at herd Level: Many Goals, Many Methods. *Acta Agric. Scandinavica Anim. Sci. Suppl.* 30:26-33.
- Lensink BJ, Veissier I, Florand L (2001a). 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 on 2nd April 2013.
- 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.
- 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. <http://www.veeru.reading.ac.uk/organic/proceedingsfinal.pdf>. Accessed on 18th September 2013.
- Organicvet UK (2007). *Animal Welfare Assessment*. <http://www.organicvet.co.uk/>. Accessed on 11th April, 2013.
- Park M, Singer P (2012). The globalization of animal welfare. *Foreign Aff.* 91(2):122-133.
- Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (PCCARD) (2005). *Philippine recommends for goat production*.
- Rassu SPG, Enne G, Ligios S, Molle G (2004). Nutrition and Reproduction In: G. Pulina (ed). *Dairy Sheep Nutrition*. CABI Publishing, Wallingford, U.K, pp. 109-128.
- Rushen J, Passille A (2010). The Importance of good stockmanship and its benefits for the animals. *Improving Animal Welfare: A practical approach*, pp. 50-65. http://www.grandin.com/inc/improving_animal_welfare.ch4.html. Accessed on 4th December 2013
- Sevi A, Massa S, Annichiarico G, Dell'Aquila S, Muscio A (1999a).

- Effects of stocking density on ewes milk and incidence of subclinical mastitis. *J. Dairy Res.* 66:489-499.
- Scott EM, Nolan AM, Fitzpatrick L (2001). Conceptual and methodological issues related to welfare assessment framework for measurement. *Acta Agric. Scandinavica, Anim. Sci. Suppl.* 30:5-10.
- Smart M (2010) 2nd Edition. *Goat production manual: A practical guide.* iUniverse, Inc., New York Bloomington.
- Sorensen J, Sandoe P (2001). Preface. *Acta Agric. Scandinavica. Anim. Sci. Suppl.* 30:3-4.
- Wemelsfelder F (2000). Qualitative welfare assessment: Reading the behavioural expressions of pigs. 4th NAHWOA Workshop, Clermont-Ferrand, pp. 20-30.
- Zulkifli I (2013). Review of human-animal interactions and their impact on animal productivity and welfare. *J. Anim. Sci. Biotechnol.* 4:25.