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3-5 November 2015

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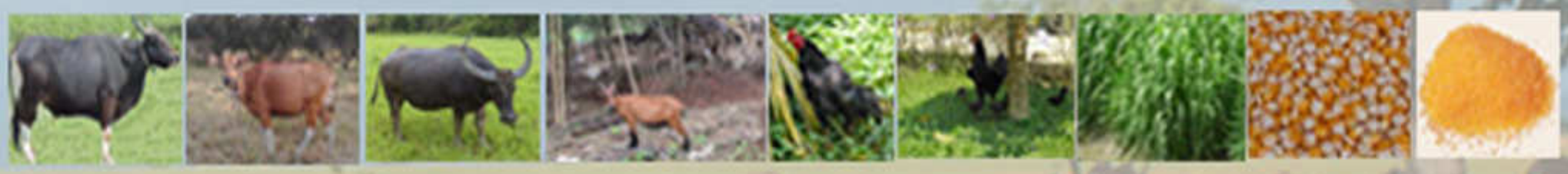

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Kendari, 2015

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Proceeding International Seminar "Improving Tropical Animal Production for Food Security"

Zainal Jaelan, Patricio S., J. Murali Dharan, W. Dollemore, Nasrullah, B. Purwantara, C. Sumantri dan Herry Sonjaya
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Remark From The Chairman of International Seminar Committee

Assalamualaikum Warahmatullahi Wabarakatuh

Distinguished Ladies and Gentleman,

As the host of the International Seminar, we are very grateful and would like to thanks to keynote speaker, all invited speakers and presenter who have prepared the papers and participating to the seminar. We strongly believe that their significant contribution will be useful to all of societies to enhance the development of tropical animal production in the future.

The theme of this seminar is "Improving Tropical Animal Production for Food Security". We believe that food issue has become important and strategic sector and it should be the main strength of the Indonesian economic empowerment. Food security in the animal production field is the concept of fulfilment food from animal which is produced using sustainable and eco-friendly farm system appropriate with local wisdom. Therefore, it was necessary to formulate various policies, programs and strategies to accelerate the improvement of the production and the productivity of the tropical animal based on the latest research.

In this seminar we have keynote speaker, Prof. Dr. Ir. Ali Agus, DAA, DEA, he is an expert in Nutrition and Feed Technology. His current position is Dean of Faculty of Animal Science of Gadjah Mada University, Indonesia. He will talk about the role of agricultural by products in beef cattle production.

Besides that, we have seven invited speakers from different countries;

Prof. L. C. Cruz, he was Head of Philippine Carabao Research Canter.

Prof. Dr. Dahlan Ismail, he is an expert in the field of integrated livestock system, Universiti Putra Malaysia.

Dr. Kieren McCosker, he is an expert in free range-based management of cattle production. He works at Department of Primary Industry and Fisheries, Northern Territory, Australia.

Prof. Monchai Duangjinda, he is an expert in animal breeding–native chicken production. His current position is Dean of Faculty of Agriculture, Khon Kaen University. He also works as Director of Research and Development Network Center for Animal Breeding (native chicken), Thailand.

Prof. A. K. Thiruvenkadan, he is an expert in animal genetics and breeding conservation. His current position is Head of Tamil Nadu Veterinary and Animal Sciences University, India.

Prof. Bui Van Doan, he is an expert in Animal Production, Faculty of Animal Science and Aquaculture, Vietnam National University of Agriculture Vietnam.

And the last, Ir. Eko Widodo, M.Agr.Sc. M.Sc. PhD, he is an expert in poultry nutrition, Faculty of Animal Science, Brawijaya University, Indonesia.

We also have participants who will deliver their researches through poster presentation. We wish all the participants could fulfill their expectation as well as enjoying the interaction among all scientists in this seminar.

High appreciation to Rector of Universitas Halu Oleo and Dean of Faculty of Animal Science Universitas Halu Oleo, who have concerned and supporting this seminar. We thanks to the sponsorship; Government of Southeast Sulawesi, Major of Kendari, Major of Baubau, Regent of West Muna, BRI, Kendari Pos, ISPI and HILPI South East Sulawesi who have contributed for the successfull of this seminar. We also would like to thanks to committee who have helped in the preparation of this seminar.

Finally thanks to you all, for the successful of this seminar. I wish all of you would be very pleasant and most enjoyable stay in Kendari.

Wassalamualaikum Warahmatullahi Wabarakatuh

Dr. Ir. La Ode Nafiu, M.Si.

Chairman of International Seminar Committee

Preface

The Proceeding of International seminar "Improving Tropical Animal Production for Food Security". The seminar was held on 3-5 November 2015 at Eddy Agus Mokodompit Auditorium, Universitas Halu Oleo, Kendari, Southeast Sulawesi, Indonesia, and organized by Faculty of Animal Science, Universitas Halu Oleo, Kendari. As much as 49 papers were contained in this proceeding. The papers consist of 8 papers from key note and invited speakers, 24 papers for oral presentation and 17 papers for poster presentation. Papers were divided into 6 categories, they are Genetic and Breeding, Physiology and Reproduction, Nutrition and Feed Technology, Forage and Pasture Management, Processing and Animal Product, and Livestock Management and Marketing.

The committee would like to say thank you very much to all of the reviewers, editorial staff, and all of the members of the committee who have given their support for the successfull of this international seminar and for the preparation of the proceeding. Finally, we would like to say thak you vey much for all the authors for their significant contribution to the seminar. We strongly believe that their significant contribution will be useful to all of societies to enhance the development of tropical animal production in the future.

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POSTER PRESENTATION

Genetic and breeeding

Physiology and Reproduction

Nutrition and Feed Technology

Processing and Animal Product

Livestock Management and Marketing

Ruminant Nutrition: The Role of Agricultural by Products in Beef Cattle Production

Ali Agus

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ABSTRACT

Increasing demand on food of animal origin including red meat in developing country is predicted doubled or even three fold in 2050, while the production especially that from ruminant legs well behind the projected human requirements. Feeding and nutrition have been reported to be the main constraint to ruminant production. In Indonesia, such as in other tropical countries, availability of feedstuffs is fluctuating during the year. Discussion on the available feeds is urgent in the face of rapidly depleting natural resources, climate change, urbanization, population pressure, decreasing land for crop production, and the increasing competition of arable land for food, feed and biofuel production. The efficiency of use of the available feed resources is very important and determinant for animal performance and productivity. The utilization of low quality feed mainly from crop residues as well as agricultural by products and other non-conventional feed resources has a common practiced. However, the different technologies are needed to maintain feed availability, improve feed quality and to optimize the nutrient utilization by the animal. This paper discuss briefly role of agricultural by products in beef cattle production. One may explore more comprehensive information concerned in this issue by accessing the papers and previous review papers as indicated in the references listed.

Key Words: Agricultural by Products, Nutritive Quality, Beef Cattle

INTRODUCTION

The production cost of animal agriculture has been increased, due to among other the increased demands of grain for food and other feedstuffs for bio-fuel production. Competition of feedstuffs utilization for bio-fuel will limit the availability of feedstuffs for animal feeding and then direct or indirectly stimulates increase of feed price. Ruminants in the tropics are in a unique position to help satisfy this demand because of the sheer abundance of crop residues and other low quality roughages often referred to as 'lignocellulosics' and their potential to support ruminant production if specific nutritional strategies are employed. Agricultural-and industrial by-products are generally rich in fiber, less digestible and less efficient to the animal. The quality and quantity of feed provided to animals is the most important input for increasing the animal productivity. The increasing expansion of agro-industrial activity over the last few years has led the accumulation of a large quantity of lignocellulosics residues all over the world.Readers may refer to the several review papers as listed in the references (Leng, 1990; Westendorf, 2000; Agus, 2009; Davendra and Leng, 2011; Makkar, 2012; Makkar and Beever, 2012; Madhwa and Bakhsi, 2013).

AVAILABILITY OF FEED RESOURCES

In Indonesia and also generally in Asean countries the major agro-residues in term of volumes generated and used as ruminant feed can be classified as : 1) crop residues were found to be rice

straw, rice husk, sugar cane tops, corn stover, corn stalk, soy bean hulls, 2) agro-industrial by products were found to be cereal bran, coconut cake, palm kernel cake, soya bean meal, molasses, biofuel co-products such as distillers dried grains and soluble (DDGS), pineapple waste, tapioca by product (onggok), coffee seed pulp,;3) non-conventional feed resources, and this category includes diverse feeds and by definition refer to those feeds that are not traditionally used in animal feeding; examples are oil palm leaves, palm press fiber, cassava foliage and other tuber foliage, sugar cane bagasse, cotton seed meal, rubber seed meal, cacao pod, fruit and vegetable wastes, aquatic plants such sea weed, and former foodstuffs(Davendra and Leng, 2011). Former foodstuffs and it should not be confused with food and catering waste that is not allowed to use as animal feed. Here we talk about former foodstuffs that are removed from the human food consumption market, by food manufacturers, because of unintentional and often unavoidable production errors. Examples of former foodstuffs used in animal feed are broken biscuits and chocolates, surplus bread, incorrectly flavored crisps, breakfast cereals, soy sauce, noodle (Westendorf, 2000). These former foodstuffs are now already commonly used as concentrate ingredient for beef cattle fattening in Indonesia.

The fibrous crop residues which have in common high biomass, low crude protein (3-4%), and high fiber content (35-48%). According to Egan (1989), crop residues can be subdivided into three categories: 1) those with low cell wall, crude fiber and lignin contents, and low digestibility (30-40%) and intake; these are not improved by chemical treatment; 2) those contains low cell wall, medium digestibility (40-50%), and capable some improvement with chemical treatment; 3) those with high cell wall contents, not highly lignified, high digestibility (50-60%) and intake. These fibrous crop residues form the base in feeding systems for ruminants and include all cereal straws, sugar cane tops, bagasse, cocoa pod husks, pineapple waste and coffee seed pulp. It is quite clear that feed availability is existing with plentiful and various type of feed. However, it seems to be quite difficult to find the quantitative data for each feed and the extent to which such feed is utilized. Quantitative estimates of the availability of feed resources and their used for ruminant feeding is needed to be updated (Davendra and Leng, 2001).

CHARACTERIZATION OF AGRICULTURAL BY PRODUCTS

According to Leng (1990), agricultural by products or crop residues that is considered also as low-quality forages are defined as those forages which are less than 55% digestible and are deficient in true protein (less than 80 g crude protein (nitrogen x 6.25; CP)/kg) and low insoluble sugars and starches (usually less than 100 g/kg). Low-quality forages are not used as the basis of diets in most temperate countries, but in tropical and subtropical countries often comprise practically the whole diet of ruminantseither grazing or fed under subsistence conditions. In these countries, which are mostly in the tropics, crop residues are a major component of a diet for large ruminants for a considerable part of or throughout the year.

The efficiency of utilization of 'low-quality' roughages by ruminants for productive purposes is altered by numerous factors which are associated with the feed or the animal. These include: 1) the availability of microbial nutrients in the feed to support an efficient microbial growth, and a high rate and extent of digestion in the rumen which in turn optimizes intake;2) the ratio of soluble cell components to refractory cell wall carbohydrates in the forage. This ratio markedly affects the population density-mix of the major micro-organisms in the rumen (e.g. bacteria, fungi and protozoa);3) the physiological state and previous dietary and health history of the animal which determines the quantitative demand for and balance of nutrients required; 4) the thermal environment which determines the requirements for substrate oxidation for maintenance of body temperature and alters the balance of nutrients available for anabolic functions;5) the chemical and physical characteristics of forage which determine the proportion of feed digested by microbial fermentation and the dietary nutrients that escape rumen fermentation and are available for digestion and absorption in the intestines.

ENSURING A BALANCED NUTRITION FOR RUMINANTS ON CROP RESIDUES-BASED DIETS

The priority for improving the utilization of a low-digestibility forage by ruminants is to optimize the availability of nutrients from fermentative digestion by: 1) ensuring that there are no deficiencies of microbial nutrients in the rumen and, therefore, the microbes in the rumen grow efficiently and, through fermentative activity, extract the maximum possible amounts of carbohydrate from the forage (i.e. the production rates and ratio of microbial cells to volatile fatty acids (VFA) produced is high); 2) ensuring that the microbial cells (which provide most of the protein to the animal) synthesized in the rumen are not lysed and fermented in the rumen but are available for digestion and absorption as amino acids from the intestines. It is also necessary to optimize the efficiency of utilization of the nutrients that arise from fermentative and intestinal digestion by supplementing with critical nutrients that escape orbypass rumen fermentation (Leng, 1990). This is to augment and balance the nutrients absorbed to provide sufficient for maintenance of homeostasis, maintenance of body temperature, exercise (or work), and any particular physiological or productive function. In any one location, therefore, supplementation strategies will need to vary according to climate, management and production targets.

OPTIMIZING MICROBIAL GROWTH IN THE RUMEN

The rumen microbes have specific requirements for both macro- and micro-minerals to meet the needs of structural components of cells and for components of enzymes and co- factors. Little is known about the requirements of the microbial milieu for trace elements and as a 'rule of thumb' it is accepted that if the animal is not deficient then it is unlikely that the rumen microbes will be deficient. However, there is more known about the requirements of microbes for sulphur, phosphorus, magnesium and ammonia (Durand and Komisarczuk, 1988). As with any deficiency of a nutrient, the likely scenario of a mineral deficiency for rumen organisms is first a reduced growth efficiency of microbes (lowered ratio of cells to VFA produced) with or without a decrease in digestibility. As the deficiencies become more extreme the digestibility of forage must decrease along with the decrease in microbial pool size and it is only then that feed intake will decrease. Correction of the deficiency will obviously have the reverse effects.

Requirements for Sulphur

Sulphur(S) is critical in the rumen for the synthesis of S-amino acids for microbial protein synthesis. A critical level in the rumen is 1ug/ml (Bray and Till, 1975). Lower levels than this are likely to deplete the size of the microbial pool, eventually decreasing digestibility in addition to lowering the protein:energy (P: E) ratio in the nutrients absorbed. The rumen fungi appear to be particularly dependent on S and grow only at low rates where plant materials are low in S. There is an absolute requirement for S and this is unrelated to CP content of a diet. Under S deficiency state, copper toxicity can result, particularly in fauna-free ruminants. S deficiencyof livestock, however, may be widespread in the tropics because of high rainfall and the highly soluble nature of most natural S salts in soil (Leng, 1990).

Requirements for Phosphorus

Phosphorus (P) deficiency is often widespread in tropical countries and P supplementation for the animal and the microbes is essential. Most protein meals or grain by-products are high in P (5-10 g/kg) and supplements of proteins often correct such a deficiency. Undoubtedly during long periods of P deficiency this mineral may become deficient in the rumen, and will reduce microbial growth efficiency and at times digestibility and intake of forage (Durand et al. 1986). Where a protein meal

is used to supplement a low-quality straw-based diet there is little likelihood of a P deficiency in the rumen.

Requirements for Magnesium

Magnesium (Mg) is often deficient in young grass, tropical forage, straw and other low-quality forages and a deficiency of Mg can reduce the digestibility and intake of forage as Mg is essential for all rumen micro-organisms and particularly for cellulolytic microbes. Mg sufficiency is a precondition for the optimal utilization of low-quality forages. Mg is not likely ever to be deficient in isolation and 'shot gun' mixtures are often the best approach to correct such a deficiency.

Requirements for Ammonia

Ensuring adequate ammonia in the rumen to supply the majority of N for microbial growth is the first priority in optimizing fermentative digestion of forage. Satter and Slyter (1974) suggested that 50-80 mg ammonia per liter rumen fluid was the optimum for maximizing microbial growth yield and this has been widely accepted. However, studies from two laboratories in Australia have indicated that the minimum level of rumen fluid ammonia for optimum voluntary intake of low-N, low-digestibility forage by cattle is about 200 mg/liter even though the digestibility of the forage (in nylon bags) was optimized below 100 mg/l (Leng, 1990).

IMPROVING NUTRITIVE VALUE OF CROP RESIDUES

Several different technologies i.e. physics, chemical, biological or microbiological technology are required to maintain feed availability, to improve feed quality and to optimize the nutritive value of the diet. The technology by utilizing microorganism in feed has long been well known such as the utilization of microbes in the ensilage process. The main objective of microbes utilization in animal feed are: 1) preserving and maintaining the nutritive value by fermentation technology such as ensilage, 2) improving the nutritive value of low quality feedstuffs and 3) improving the stomach (rumen) condition thus optimizing the digestion and absorption of the nutrients by the host. The microbes effective (or effective microorganisms) to be used in animal feed might be bacteria, fungi, yeast or mixture of them (bacteria, yeast, fungi) or its fermentation products or extracted products of fermentation process such as enzymes. At this time being, some commercial farms in Indonesia have already adopted this method of fermented rice straw as the fiber sources of the livestock (Agus, 2009).

Basically, biological treatment is a limited composting. During the composting, decomposition of organic matters occurs through biochemical process that involved microbes. In the initial process of composting, the temperature will increase and microbes will multiply. Later, the degradation will slowed down until the balancing point is reached. During the fermentation, the protein percentage will increase, and most of component's residue that had been digested from the metabolized one will decrease the dry matters digestibility. Utilization of EM in the fermentation process of rice straw has shown the positive impact on the nutritive value to the animal. This method has been adopted by many farmers and feedlot industries in many parts of Indonesia (Agus, 2009).

Effective microbes has been using in the animal production to optimize the nutritive value of low quality feed and improve the performance of livestock. Many types of EM, single or mixture of different microorganisms, have been commercialized and now available in the market. In Indonesia, the utilization of EM in laboratory scale or field conditions has been practiced widely and showed the positive effects to the animal performances. However, the mode of action of the EM in the digestion, metabolism and its safety aspect, as the increased demand of natural and healthy animal product, thus it need further evaluation.

CONCLUSION

The availability and efficient use of the feed resources are the primary driven of performances to optimize productivity from livestock. Role of agricultural by product will play more and more important in the future for ruminant feeding especially in the topics. Underutilized feed resources available such as fibrous crop residues, agro-industrial by products or other non-conventional feeds need to be optimized either through biotechnology treatment such as fermentation method to improve their nutritive quality or supplementation strategies especially minerals or protein sources to optimize the rumen microbes in fermenting the fibrous feed thus maximizing their nutrients used for optimum ruminants production. Further research on quantitative estimates of respective agro-industrial feed resources and its utilization for optimum ruminant production is required particularly in the tropical regions.

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Breeding Strategies for Improvement of Global Traits in Thai Indigenous Chicken

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ABSTRACT

Poultry industry in Thailand has become a large industry and important for the economy of the country. With the food safety regulations, only evaporative system or closed system are allowed for commercial scale of poultry production. A sustainable poultry production has promoted utilization of indigenous chicken. Thai indigenous chicken (TIC) is defined as a native species. There are several strategies to improve economic traits in chickens. The improving growth, egg production and climate change adaptation traits is a success model in improving Thai indigenous chicken genetics via the conventional and molecular breeding (using candidate genes approach), also crossbreeding with commercial breeds for large scale production.

Key Words: Thai Indigenous Chicken, Candidate Genes Approach, Exotic Breeds

INTRODUCTION

Recently, poultry industry in Thailand has become a large industry and important for the economy of the country. Chicken can give both meats and eggs as a low cost protein source. It still has no limitation for religious or ethnic traditions compared to pigs and cattle, thus poultry products can be acceptable as animal protein for most people. Thai indigenous chickens (TIC) (*Gallus domesticus*) is defined as a native species and is generally found in small villages, where farmers typically raise them for home consumption, sales for cash when the flock gets too large, and for fighting cocks (FAO, 2009). Certain larger consumers have acquired a taste of native or indigenous chicken with strong and tough muscles and it is an alternative for consumers preferring low fat and antibiotic-free white meat, characteristics regarded as quality when compared with the over-tenderness of broiler meat. Nowadays, domestic chickens have been selected and developed to human demand. Indigenous chickens have high potential for breeding program.

A sustainable management and utilization of chicken genetic resources are considered as native or indigenous. In Thailand, 50% of TIC was raised by nearly 6 million households that are sustainable on genetic diversity and also conservation of TIC (Chophakarn and Wongpichet, 2007). Utilization, TIC has a good characteristic i.e. resistance to disease, tolerance to heat stress, good meat quality, are the advantage of TIC lead to cross with exotic breeds in commercial. Currently, there are several methods to improve these traits in chickens. The main methods for more successful to improve growth, carcass and meat quality traits are feed and feeding management, genetic improvement by conventional and molecular breeding. This review focuses on the utilization of the genetic resources in Thai indigenous chicken.

THE POULTRY DIVERSITY OF GENETIC CHARACTERIZATION INFORMATION

Genetic diversity showed the variations, which gave basic information on the status of chicken flows resources. Thai indigenous chickens were identified as strains based on their

phenotypes (Duangjinda et al., 2009), which are similar to other countries such as, the Bhutanese indigenous chickens and also named on the morphology (Dorji, 2010).Theoretically, genetic selection lead to cause the change in genetic makeup or change of genes frequency lead to the fix and loss of genes associated with specific characteristics (Falconer and Mackay, 1996). As an example, the selection for economic traits may have caused the low observed heterozygosity (H_O), which may lead to positive assortment or a situation of high homozygosity e.g. HSP70 gene in loci C1C2 is related to heat tolerance. On the other hand, high H_O of M1M2 and M1M2 are related to and heat susceptibility (Duangduen, 2008). The loss of H_O for heat tolerance reflected high selection pressure on production traits in broilers (Akaboot et al. 2012). According to reported by Tunim (2012) who reported that the polymorphism of *HSP*70 in 2 loci showed that C locus had 3 genotypes (C1C1, C1C2 and C2C2) whereas M locus had 2 genotypes (M1M2 and M2M2). Genotype and allele frequency were similar among strains and mostly genotype in M locus was M2M2. The genetic diversity of *HSP*70 at C locus was higher than M locus therefore C locus was selected to be used in the study of *HSP*70 genotype effect on heat tolerance.

IMPROVING PRODUCTION RELATED GENETIC OF THAI INDIGENOUS CHICKEN

Improving of growth traits

The growth rate of TIC was slower than commercial broilers (Wattanachart et al, 2004; Jaturasitha et al., 2008).TIC were fed *ad libitum* with commercial layer diet, the body weight at slaughter (12 weeks) wasranged from 907.81 to 1175.6 g (Table 1).On the other hand, broilers chicken, the body weight at 4 and 6 weeks were 1,186.39 and 1,997 g (Promvatee 2011).

Table 1. Growth performance in Thai indigenous (Pradu-Hang Dam and Chee)

Traits[1/]	Pradu Hang Dam				Chee			
	male		female		male		female	
	Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd
BW0	35.96	3.51	35.25	2.55	30.17	2.33	30.56	2.91
BW4	234	35	216.18	39.6	205	48.9	190.16	34.95
BW8	631.2	94.27	555.27	94.69	571.9	117.69	535.16	116.43
BW12	1175.6	147.06	1019.27	160.88	1113.45	168.63	907.81	123.2
BW16	1708.4	222.93	1437.27	237.51	1536.21	214.18	1089.06	124.91
BrA	24.26	1.2	23.13	1.41	26.21	1.54	23.59	1.27
BrW	60.88	4.88	55.78	5.01	63.97	5.51	57.38	3.61
ADG0-4	7.07	1.26	6.46	1.39	6.24	1.72	5.7	1.25
ADG0-8	10.63	1.68	9.29	1.68	9.67	2.08	9.01	2.08
ADG0-12	13.57	1.75	11.71	1.91	12.9	2	10.44	1.47
ADG0-16	14.93	1.99	12.52	2.12	13.45	1.91	9.45	1.12

[1/] BW0, BW4, BW8, BW12 and BW16 = Body weight (g) at hatch, and at 4, 8, 12,and 16 weeks of age respectively; BrA = Breast circumstance (cm.) at 16 weeks of age; BrW = breast width (mm.) at 16 weeks of age; ADG0-4, ADG0-8, ADG0-12 and ADG0-16 = average daily gain (g/day) during 0–4, 0-8, 0-12 and 0–16 weeks of age, respectively.
Source: Promvatee (2011).

Egg production and reproduction traits

Generally, the native or indigenous chickens have a faster maturation, about 6-8 months for maturation.With these excellent characters to rapid produce the number of chickensthat lead to

produce the number of chickens is not enough for marketing. In Thailand, poultry production and consumption are increasing, but we have some problem from reproductive i.e. low number of eggs especially in indigenous chickens. However, estimated heritability for egg production, fertility and hatchability percentages were low, which was similar with several breeds (Szwaczkowski, 2003). So, only genetic evaluation for reproductive traits cannot used for the improvement of reproductive performance but have to consider other important factors such as feed, feeding and management practices have to be considered as well (Boonkum et al., 2014). Even though, low heritability or traits for which measurement of phenotype is difficult, expensive, only possible late in life, or not possible on selection candidates. Molecular genetics marker more enhanced selection progress and efficiency. Charoensin (2012) reported that*24BP-PRL* gene and *VIPR1*gene was appropriate to use as genetic marker for genetic improvement of egg production trait in Pradu Hang Dam.

Resistance to heat Stress

The main factor constraint on chicken production in South-east and central Asia is the climate. A severe heat stress on chicken leads to reduced performance have been influenced from high temperature, high humidity and coupled together (Daghir, 2008). In broiler chickens, the affect of climate have influenced on egg quality i.e. thin shelled eggs, less of sperm production lead to reduces fertility, poor hatchability, included reducing the breast meat yield and meat being pale (Daghir and Jones, 2008; Cahaner, 2008). Therefore, section should be considered in the effects of high temperature on reproductive performance, mainly fertility and hatchability

Heat tolerance in poultry production needs the genetic lines that can endure environmental challenges. The heritability of heat tolerance is quite high that is quick progression (El-Gendy and Washburn, 1992; Yamada and Tanaka, 1992). The different breed is differing tolerated; the White Leghorn (WL) showed a greater tolerance for high temperatures than heavier breeds such as Rhode Island Reds (RIR), Barred Plymouth Rocks (BPR), White Plymouth Rocks (WPR) and also Australorps (Gowe and Fairfull, 2008). While as, the several indigenous breeds are the best performed under high temperatures. Several major genes have a role on heat tolerance in some chicken breed i.e. gene directly affected on reducing feather cover naked neck (Na), and also frizzle (F) affected on contour feathers (Gowe and Fairfull, 2008). For Thai indigenous chicken, C2C2 genotype of *HSP*70 showed more responsive to heat stress, consequently C1C1 and C1C2 genotype could probably use as a heat tolerance genetic marker (Duangduen et al., 2008; Tunim, 2012).

Genetic for tropical disease resistance

In general, within chicken breeds or strains are also possible to breed selectively for greater disease resistance. In part of breeding, a controlling chicken disease is the development the breeds or lines that are resistant to disease and parasites needed to be considered. The heritability estimated for disease resistance was quietly low (Szwaczkowski, 2003). The genetic resistances to bacterial, viral, and parasitic diseases in chicken were detected by molecular genetics techniques based on genetic control in response to specific diseases. As an example, Histocompatibility Complex (MHC) resistance gene were used in breeding programs for Marek's disease resistance (Bumstead 2003) and *Zyxin,TCR-β and MLF2* gen for resistance to avian coccidiosis. The polymorphism of *NRAMP1* gene significantly associated with resistance to salmonellosis (Girard-Santuosso*et al.* 2002).

Utilization of chicken genetic resourcesin Thailand

Thai indigenous chicken or Thai native crossbredis popular for meat quality;good meat texture, low fat or cholesterol white meat compared to commercial broilers (Kunhareang 2014). Nowadays, indigenous chickens have been selected and developed to human demand. In Thailand, Research and Development Network Center for Animal Breeding (Native Chicken), Khon Kaen University, Thailand (NCAB) developed Four Thai synthetic chickens i.e.Kaen Thong (KT), Khai Mook Esarn (ME), Soi Nin (SN) and Soi Pet (SP). These chickens were developed from Thai native chickens.

Chickens have very different morphology and the details of morphological characterization of each line. The appropriations to utilize for synthetic lines were showed in Table 2.

Candidate genes approach in Thai indigenous breeds and syntactic breeds

An application as a candidate marker for selecting chicken growth traits (Table 3 and 4) , candidate gene polymorphism with phenotypic data of growth traits showed that only *cGH1* gene was significantly associated with BW8 and ADG0-8 in Chee population. Moreover, the EBV data showed that *IGF-I, cGH1* and *ApoB* genes were associated with some genetic effect of growth traits (BW0, BW8, BW16, ADG0-8 and ADG0-16) in Chee population. In addition, the *ApoB* gene was associated with only birth weight in Pradu Hang Dam as Chee population and cholesterol level at 10 weeks in Thai native crossbreed (Kunhareang 2014).

The several gene significantly affected to growth traits i.e. *IGF-I* and *cGH1* genes should be accelerate the improvement of growth traits in Chee population, which should be sire line for Thai synthetic chicken. Four Thai synthetic chickens, candidate marker for selecting chicken growth traits was not consistent with original Thai indigenous breed. *IGF-I* gene associated with some growth traits in four Thai synthetic chickens. In the carcass traits, the *IGF-I* gene polymorphism was significantly associated with dressing percentage and pectoralis major weight percentage only in the ME population , which polymorphism has an effect on growth and carcass traits by enhancing gene expression (Amills et al., 2003; Zhou et al., 2005; Beccavinet al., 2001*).* On meat quality traits*, IGF-I* gene was associated with cooking loss for breast meat in KT population, shear force for KT and ME population for thigh and drumstick (Promwatee, 2012).

Table 2. Description of four Thai synthetic chicken lines

Lines	Morphological features			Future purpose
	Comb type	Plumage	Shank and beak	
KT	Single or pea	Males and females are golden brown	Yellowish	• Develop for dam line or organic egg production
ME	Single or pea	Both adults entire plumage is pearl white	Yellowish	• Develop for Thai broilers
SN	Single or pea	Males and females are mainly white	Yellowish	• Develop for free range, backyard or body, while the neck and wing are an onyx color organic chicken, and an alternative line for Thai crossbred
SP	Single or pea	Males are mainly black on the ventral part	Yellowish to black	• Develop for free range chicken, and an alternative line for Thai crossbred

KT = Kaen Thong; ME = KhaiMookEsarn; SN = Soi Nin; SP = Soi Pet.
Source: Charoensin et al. (2014)

Table 3. Effect of eight candidate genes genotype on growth traits (EBV data) in Thai indigenous chicken(Cheeand Pradu Hang Dam population)

Breeds	Genes	Genotypes	n	Traits[1/]									
				BrA	BrW	Body Weight (g)					ADG (g/day)			
				(cm)	(mm)	0	4	8	12	16	0-4	0-8	0-12	0-16
Chee	*IGF-I*	AA*	5	0.31	0.27	0.54	6.39	3.12	23.87	19.96a	0.15	0.04	0.31	0.23a
		AC	20	0.26	0.32	0.17	5.27	5.52	18.46	19.30a	0.16	0.09	0.21	0.19a
		CC	34	0.09	-0.01	0.32	4.22	4.57	3.38	-3.47b	0.12	0.08	0.01	-0.03b
			SEM	0.11	0.28	0.38	2.36	3.85	12.73	10.52	0.06	0.06	0.16	0.10
	cGH1	AA*	0	-	-	-	-	-	-	-	-	-	-	-
		AG	17	0.16	0.09	0.02b	4.47	-0.30b	7.72	1.10b	0.11	0.001b	0.09	0.02b
		GG	43	0.28	0.30	0.70a	6.12	9.11a	22.75	22.76a	0.17	0.14a	0.26	0.24a
			SEM	0.10	0.25	0.34	2.12	3.47	11.48	9.49	0.06	0.06	0.15	0.09
Pradu-	*ApoB*	GG	14	0.75	2.28	1.80ab	17.79	58.27	111.52	165.48	0.59	0.93	1.21	1.45
Hang-		GT*	24	0.89	2.45	2.36a	23.93	69.63	127.30	178.95	0.81	1.14	1.37	1.56
Dam		TT*	39	0.79	2.26	0.92b	20.50	54.70	111.97	160.20	0.68	0.86	1.23	1.43
			SEM	0.16	0.47	0.59	6.07	11.96	21.46	27.62	0.21	0.21	0.25	0.24

[1/]BrA and BrW = Breast circumstance and breast width at 16 weeks of age respectively,

[a,b] within a column in each gene with no common superscript are significant difference (P<0.05),

* Genotype that associated with high growth traits from previous study.

Table 4. Effect of eight candidate genes genotype on growth traits (EBV data) in in four Thai synthetic chickens

Breeds	Genes	genotype	n	EBV data[1]									
				BrA	BrW	Body Weight (g)					ADG (g/day)			
				(cm.)	(mm.)	0	4	8	12	14	0-4	0-8	0-12	0-14
Soi Nin	*IGF-I*	AA*	71	0.01	-0.25	2.02a	0.91a	13.02a	6.66	-9.85	0.01a	0.20a	0.08	-0.15
		AC	143	0.03	-0.08	0.34b	-1.06a	9.37a	12.90	0.88	-0.04a	0.13a	0.16	0.05
		CC	69	0.01	0.03	0.22b	-6.60b	-7.30b	1.54	-15.77	-0.28b	-0.19b	0.04	-0.12
			SEM	0.02	0.11	0.32	1.32	2.65	4.62	8.58	0.04	0.04	0.05	0.08
	cGH1	AA*	79	0.02b	-0.14b	0.40	-2.44b	2.67b	7.32b	-1.91a	-0.10	0.01b	0.09b	0.00a
		AG	68	-0.09c	-0.55c	0.23	-4.95b	-6.24c	-10.84c	-30.13b	-0.16	-0.12c	-0.09c	-0.29b
		GG	142	0.11a	0.40a	1.96	0.64a	18.66a	24.62a	7.30a	-0.04	0.25a	0.29a	0.08a
			SEM	0.02	0.11	0.32	1.31	2.64	4.60	8.55	0.04	0.04	0.05	0.08
Soi Pet	*IGF-I*	AA*	13	0.31	0.42	0.54a	21.87a	63.78a	113.35a	130.95a	0.70a	1.05a	1.35a	1.31a
		AC	93	0.22	0.08	-0.76b	14.27a	43.98a	78.83a	70.91a	0.60a	0.79a	0.94a	0.76a
		CC	135	0.15	0.10	-0.45b	7.57b	21.30b	38.77b	34.36b	0.33b	0.39b	0.48b	0.43b
			SEM	0.07	0.15	0.24	3.18	8.06	13.56	16.61	0.11	0.13	0.17	0.16
Mook Esarn	*IGF-I*	AA*	51	0.05a	0.75a	-0.08	17.02a	39.65a	82.65a	25.58a	0.63a	0.71a	0.90a	0.20a
		AC	140	0.01a	0.42a	0.24	15.63a	33.84a	66.96a	9.63a	0.59a	0.60a	0.74a	0.05a
		CC	111	-0.11b	-0.09b	0.36	11.09b	10.76b	29.68b	-24.97b	0.42b	0.20b	0.31b	-0.29b
			SEM	0.02	0.17	0.29	1.52	4.76	9.04	7.22	0.05	0.08	0.10	0.07
Kaen Thong	*IGF-I*	AA*	56	0.25	0.38	-1.40a	-2.69a	-5.80	-12.66	-34.26	0.03a	-0.05	-0.10	-0.25
		AC	98	0.18	0.33	-3.36b	-9.57b	-14.94	-9.53	-14.96	-0.11b	-0.19	-0.06	-0.06
		CC	66	0.18	0.32	-2.81b	-8.05b	-20.40	-10.34	-16.03	-0.12b	-0.30	-0.08	-0.09
			SEM	0.05	0.09	0.41	2.01	5.29	8.87	13.16	0.04	0.09	0.10	0.13

[a,b] within a column in each chicken line with no common superscript are significantly different ($P<0.05$).

[1]BrA and BrW = breast circumstance and breast width at 14 weeks of age respectively; ADG = Average daily gain

* Potential genotype from previous study

CONCLUSION

Thai indigenous chicken (TIC) is defined as a native species. Currently, there are several methods to improve these traits in chickens. TICs were developed four Thai synthetic chickens. The main methods for more successful to improve growth and adaptation traits on climate change is selection via to conventional breeding and candidate genes approach and including mating selection by crossing with exotic breeds for commercial production.

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Institutionalization of Swamp Buffalo Development in The Philippines

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ABSTRACT

The Asian swamp buffalo, representing 20.51% of the world's buffalo population, has played a major role as source of draft power in the production of major agricultural crops, and secondarily, as source of meat and milk among East and Southeast Asian countries for centuries. In the past few decades, however, the intensification of crop farming, coupled with increased farm mechanization, diminished the swamp buffaloes' role as source of draft in small farms. Despite this development, their value as source of livelihood and food remains high in small farm settings. To fully harness the potentials of this huge existing animal resource to contribute to the growing demand for ruminant-derived products and more importantly, to benefit the smallholders by way of increased income and access to nutritious food, the direction for its development can be shifted towards improving for meat and milk production. Genetic transformation is pursued thru cross breeding and sustained backcrossing with riverine buffalo breeds. For a wide-scale crossbreeding and genetic improvement program to be achieved and sustained, a national policy has to be legislated and the necessary program elements need to be institutionalized, including focused funding and human resources. Critical elements include the establishment of National Gene Pool of elite riverine buffaloes from where genetic materials for wide-scale crossbreeding will be derived. Complemented with a responsive AI system for maximum use of superior genetics. A scheme to stimulate village buffalo-based entrepreneurship with emphasis on the dairy aspect is essential in order to ensure ready market and increased income among small hold producers. Further, essential components are relevant research and effective extension services.

Key Words: Philippine Carabao, Swamp and Riverine Buffalo Crossbreeding, Small Farm Enterprise Development, Buffalo Meat and Milk Production

INTRODUCTION

There are 199.7 million water buffaloes in the world as of 2013 (FAO, 2015), of which 97 % are in Asia. The swamp type found in Southeast Asia are generally used for draft, while the riverine type found in South Asia, South America, Europe and Africa are mainly milk type. By and large, the Asian water buffalo is smallholders' animal.

The history of swamp buffalo is basically a history of small hold land-based agriculture, since, for centuries, the swamp buffaloes have played a major role in draft animal-dependent farming systems, mainly in the production of major agricultural crops, such as rice, corn, sugarcane and coconut. In recent years, however, developments in land-based agriculture in East and Southeast Asia, such as the expansion of irrigation facilities and farm mechanization, have significant impact on the use of draft buffaloes. Intensified rice production became more pronounced in irrigated areas and this has led to increased

utilization of small farm machineries, significantly displacing the draft buffaloes. The introduction of tractors for land preparation and transport of produce in corn, sugarcane and other crop production areas have had similar effects.

The interest in developing the already existing huge population of swamp buffaloes beyond being a draft animal, to improving the genetic potentials for meat and milk through crossing with riverine-type buffaloes is becoming profound given the growing demand for ruminant-derived products in view of increasing urbanization, increased income and the associated changes in food preferences. This lends more meaning in light of the need to address the growing issue of low income among smallholder farming families amidst the rising cost of farm inputs, thereby creating significant impact on the net income derived from the traditional crop-dominant farming system. The technical aspect of such crossbreeding has been a subject of research interest for several years in view of the known differences in their chromosome numbers, swamp buffalo has 2n=48 while the riverine type has 2n=50. Today, there are enough evidences that this effort is feasible as exemplified by large-scale crossbreeding being implemented in China and the Philippines.

HUMAN POPULATION, LIVESTOCK PRODUCTION AND FOOD SECURITY

Human population and the Asian setting

The history of human development is relatively young considering that the earth was formed some 4.54 billion years ago, and that the first simple life forms appeared between 3.8 and 3.5 billion years ago (Ohtomo *et al*., 2013). Modern humans are believed to have originated only around 200,000 years ago (Gibbons, 2003) and only until around 1800AD that global population reached its first billion. The second billion was recorded to have been reached 130 years later (1930) and now, world human population grows by 1 billion almost every 12 years. Today, global human population is 7,307,331,185 (PRB, 2015).

Technological developments in the past, such as tool making, agricultural revolution and industrial revolution, coincided with the growth in human population. These developments contributed immensely to the ability of humans to produce food. The agricultural and industrial revolutions increased food production through introduction of farm machineries that allowed opening of new lands, improved plant varieties, use of fertilizer and herbicides, and better animal genetics, among others. On the other hand, development in medical sciences allowed humans to have better health and reduced mortality rate, live longer, and thus finally contribute to increase in population.

By 2050, human population is estimated to be 9.6 billion (UN, 2012), with more people drifting from rural areas to the urban areas. China, the home of swamp buffaloes, is expected to have 1.36 billion people in 2050, a minor decline from the current 1.37 billion level, whereas SEA is projected to have 0.839 billion people by 2050, a 17.3 % increase from the current 0.628 billion (PRB, 2015). In fact, SEA has an annual fertility rate of 2.4, higher than most regions of the world, except Africa.

Of interest is the fact that a large percent of these people depend on agriculture, and among the people in land-based agriculture, the size of landholding has become smaller over the years. This trend happens in countries with slow industrial growth amidst the fast increase in human population (Table 1). In this case, the generation of job opportunities outside of the traditional agriculture cannot cope with increases in available labor and thus the relative number of people in the farming communities have to source livelihood from

static, albeit decreasing cultivable land area. Income from this system is not sufficient to support a family.

Table 1. China & SEA GDP/Capita, agriculture as % of economy, % of labor in agriculture, buffalo population, and % change in buffalo population (1960 vs 2013).

Country	Human population (M)	Agri as % of Economy (%)	GDP/ Capita ($)	% of Labor in Agri (%)	Buffalo population 2013 (M hd)	% Change in Buffalo Population (1960 vs 2013)
China	China	China	China	China	China	China
Cambodia	15.4	34.7	2,490	57.6	0.676	+35.0
Indonesia	255.7	15.3	4,943	38.3	1.48	-48.7
Lao PDR	6.9	42.6	2,700	75.1	1.18	+166.1
Malaysia	30.8	12.0	15,800	13.0	0.12	-65.2
Myanmar	52.1	43.0	1,300	70.0	3.25	+174.2
Philippines	103.0	12.3	4,263	52.0	2.91	-15.6
Taiwan	23.5	1.6	21,592	5.2	0	-100
Thailand	65.1	8.6	5,382	49.0	1.21	-75.4
Vietnam	91.7	20.0	3,545	53.9	2.55	+27.7

Source: Population Reference Bureau, 2015, FAOSTAT, 2015; National Statistic Office of various countries

Additionally, the rise in oil prices in recent years had significant impact on the cost of farm inputs, essentially the oil-based products, such as fuel and fertilizer, which led to a considerable increase in the cost of production. This simply implies that, despite increases in yield as in the case of rice farmers, smallholders' income from traditional crop remains low. In the Philippines, while net income from rice production increased by an average of 12.11%/year from 2004 – 2010, mainly due to 8.16% annual increase in buying price of paddy rice (Philrice, 2012), their net income remain relatively low at $363.97/ha/cropping. At two cropping/year, this is translated to only $722.95/ha/year. Given an average farm size of 1.3ha/household, it would be difficult to support the basic needs unless other sources of income are available (Cruz, 2007; 2013). Additionally, due to inflationary effects, rural farming families are caught in a tight situation of declining purchasing power. Undeniably, measures to generate sources of additional income for the millions of farming families are a priority consideration. This development is a major reason for massive labor migration from rural to urban areas. But since in many urban areas the employment opportunities are not as robust, the result is the increases in number of urban poor. In a sense, this urban migration adds to the urban food requirements, with the urban poor becoming food-insecure as well.

One prominent resource common among the smallholder farming families is their swamp buffaloes. In China and SEA countries, there are about 36.7M of these animals (FAO,

2015), each family having 1-3 hd on average. For hundreds of years, these swamp buffaloes have been used mainly for draft, and perhaps, in the many years ahead, a good percentage of the farming families will still depend on this animal resource for the same purpose.

Chantalakhana (1994) clearly described the fate of swamp buffalo in smallholder integrated farming system (IFS) predominant in East and South East Asia. The complementarity of small tractor and draft buffalo in intensively irrigated IFS is common, with buffalo either used for draft for specific purpose, or is raised for meat. In fact, in areas where F_1 crossbreds have been produced, the big body size is desired for pulling bigger loads and rice thresher machine, particularly in inland areas with no well-established farm road system. Same thing is true for those farmers whose interest is to raise buffaloes for meat purpose.

Growing demand for animal-derived products in SEA

Many Asian countries have registered sustained economic growth in recent years and this has also resulted in increased establishment of urbanized areas. The rise in income among urban population has also brought about a corresponding shift in food preferences as demonstrated in greater demand for beef and milk. With the reduced land area for grazing and forage production, the only immediate option to meet the growing requirements is increase in imports of milk and beef in recent years.

Southeast Asia is a net importer of milk and dairy products, with the Philippines and Malaysia importing almost 99% of their requirements while Indonesia and Thailand import about 60.0 and 50.0 percent of their milk and dairy requirements, respectively. On the other hand, China's dairy industry is growing in concert with its extremely fast economic growth, thus, with barely 3.2% dairy imports.

It is easy to understand that sudden rise in meat demand in the fast-growing population of Asia can be met by intensive production of chicken and pork. This has taken place in China and Southeast Asian countries in significant magnitude, of course, with corresponding increases in imports of feed grains. Requirements for beef in these countries are met by massive imports of buffalo meat from India, with Malaysia and the Philippines leading with 75.2% and 35.8% of their domestic requirements, respectively, coming from importation. China is nearly self-sufficient with only 2.5% of its requirements coming from imports.

As a long-term development strategy, however, efforts in fast-growing economies in Asia have also included programs to enhance growth in their respective local dairy industry with massive infusion of stocks of "tropicalized" dairy cattle from Australia and New Zealand. This development approach is becoming more meaningful in most of the Asian countries that remain net importers of milk and dairy products as prices of milk in the international market have surged in view of the policy and regulatory measures in some exporting countries and also due to unfavorable climatic factors that resulted in reduced production and thus in traded milk in the international market. With the rising demand for same dairy animals for restocking farms in post-BSE Europe and Latin America, however, prices of dairy breeder stocks have also significantly increased lately.

Livestock production and food security

The production of animal-derived food is at the heart of world agriculture today owing to the increasing demand associated with fast growing urban population, increased income and accompanying change in food preference. It contributes 40% of global

agricultural domestic product and provides income and livelihood for more than 1.3 billion people (Thornton, 2010). It becomes apparent that the major challenge today and in many years to come is how to produce more food, particularly of animal origin, under finite, yet declining availability of land and water resources, and the increasing fragility of the environment. On the positive note, technological developments in animal production, particularly in genetic improvement in livestock, aided by reproductive and related biotechnologies in the past 50 years have demonstrated the possibility of producing highly productive and efficient animals (Cruz, 2015ab). The continuing development in these areas would allow further improvements in the way livestock will be produced in the coming decades in response to growing demand for animal-derived products and concerns about environmental footprints.

The growing human population is central to the debate about food sufficiency and food security. Food sufficiency is a generic term and it involves addressing level of production sufficient to meet the requirements, both in quality and in quantity. Food security is a far more complex issue as it encompasses availability, access, safety as well as sustainability. The theory behind the "population bomb" proposed by Malthus in the early 18th century, and of late by Paul Elrlich was proven wrong as the overall food production globally during the past decades has grown substantially and surpassed the global food requirements. The main issue is that there are regions of the world whose population has per capita consumption way above the recommended nutritional level, yet there is a substantial number of countries with food consumption per capita way below the standard. Based on FAO statistics, the world average per capita availability of food for direct human consumption, after allowing for waste, animal-feed and non-food uses, reached 2,770 kcal/person/day in 2005/2007, implying that in principle, there is sufficient global aggregate food consumption for everyone to be well-fed (Alexandratos and Bruinsma, 2012). The reality on the ground was that, some 0.5 billion people are in countries with less than 2000 kcal, some 2.3 billion people live in countries with under 2,500 kcal, and, whereas 1.9 billion are in countries that consumed more than 3,000 k cal. Food distribution and access appear to be the main issues.

Within country, it is also obvious that there are issues on food security. While there are figures of increases in harvest of cereals and other food items and are readily available to the sector with purchasing power, the main issue is access by those sectors of the society whose income level is relatively scarce. The rural poor, whose main source of income is agriculture, is more vulnerable to this kind of food insecurity. Unless there are non-farm income derived by member/s of the family, particularly those that depend on rain-fed agriculture, meeting the food requirements is a tall order.

This paper will not exhaust discussion on food security. Suffice it to recognize that in the livestock sector, the contributions of the smallholders system are very significant where producers regard the animals as more than just a mere source of income. It is this sub-sector where producers have low income and animal production efficiency is relatively lower. Most of the swamp buffaloes are owned by these smallholders, and these animals are regarded mainly as source of draft or traction for agriculture and for other purposes, providing manure for crop nutrient recycling, food-producing asset, and a ready "bank" in case of emergencies. It is these animals that consume products available in the farm but are not suitable for human and monogastric animals consumption.

On the other hand, there is the intensive commercial sector where livestock production is for profit, and where increases in production efficiencies are readily noted.

The intensive system of animal production cannot be regarded as a realistic means of providing food security to the rural poor (Lukefahr and Preston, 1999). But the intensive production system is more technologically developed sub-sector and certainly can address the growing urban's population food requirements of animal origin (Neeteson *et al*., 2014). Production of these animals rely heavily on imported feed grains as Asian farm holdings are relatively small and cannot afford to support extensive grazing as well as large-scale feed grain production. This production system could possibly be affected by the emerging trend of large-scale biofuel and bioenergy production requiring land and feed stocks (Place and Meybeck, 2013).

CONTRIBUTIONS OF WATER BUFFALO

For hundreds of years, water buffalo has been a part of the human development landscape, originally as sources of draft power in opening new farmlands, for tillage and transport, and as source of food. Developments in animal husbandry in later years resulted in specialized use of buffalo as important source of milk and secondarily of meat. In 2013, milk production from water buffalo was 97,147,135 MT, representing 13.47% of the world's milk production. During the same period, buffalo meat production was 3,597,340 MT, representing 5.37% of total global beef supply (FAO, 2015). In some countries, such as India, Pakistan and Nepal, the contribution of buffaloes to the overall national milk production is greater than that of dairy cattle, and the share ranged from 55.0% to 71.1 % (Table 2). The contributions in terms of draft power is undeniably huge but is quite difficult to quantify as draft buffaloes are used mainly as an input in crop-dominant smallholders farming systems in developing economies. In recent years, however, the aggressive farm mechanization of many countries resulted in dramatic decline in population of draft buffaloes. In view of this development, some countries endowed with significantly large swamp buffalo population are transforming this breed from purely draft animal to becoming potential sources of milk and meat by crossing with the riverine breeds, as in the case of the Philippines and China.

Crossbreeding swamp x riverine type buffaloes. Utilization of the existing population of swamp buffaloes in hot and humid tropics and harnessing the age-tested abilities of the small hold farmers to rear these animals to provide opportunities for millions of smallholder farming families to earn additional income, and also to meet the growing domestic demand for milk and meat, against the backdrop of increasing farm mechanization, are good reasons to transform the huge number of draft animals into producers of milk and meat.

Given the abundance of low-cost labor among farming families, the production cost for milk and meat from crossbred buffaloes becomes competitive. With the net income derived from crop-dominant farming system as reference, it has been demonstrated that net income from milk of 1 to 2 crossbreds is sufficient to double the income of the smallholder family tending a hectare of rice. The added advantage in dairying is the derivation of cash income on a daily basis from the sales of milk while on the long wait for harvests from crops.

Table 2. World Milk Production from Buffalo and Cattle, 2012

Country	Milk Production, MT		Buffalo Milk as % of Total
	Buffalo	Cattle	
Major Producers			
India	66,000,000	54,000,000	55.0%
Pakistan	23,652,000	13,393,000	63.4%
China	3,080,000	37,419,000	7.6%
Egypt	2,650,000	3,250,000	44.9%
Nepal	1,153,838	468,913	71.1%
Other Countries	881,297	517,223,348	0.001%
TOTAL	97,147,135	625,754,261	13.47%

Source: FAO, 2015

Changing swamp buffalo population

The changes in behavior of swamp buffalo population in East Asia and South East Asia over the last 50 years, shown in Table 3, is a result several economic and social developments. There are countries with sustained growth in buffalo population such as China, Cambodia, Lao PDR, Myanmar and Vietnam. On the other hand, five countries have registered negative growth in number of buffaloes, namely, Indonesia, Malaysia, Taiwan, Thailand and the Philippines.

Decline in swamp buffalo population was noted in the most southern island of Japan, though in very small population, in the early 40's during the massive mechanization of farming. The same trend was noted in Taiwan in the early 60's. From the population of about 324,516 in 1960, the number declined steadily (Lin, 1975). The continuous erosion in buffalo population occurred during those early years as the increase in power tillers was at the rate of 3,500 units per year (Lin, 1975). To date, swamp buffalo in Taiwan is a zoo animal.

Substitution of buffalo with tractors also occurred as early as 1957 in the central plain of Thailand (Na Puket, 1975). This is the region of the country where swamp buffaloes are most dense. The trend in swamp buffalo population in Malaysia and Indonesia has very similar pattern.

In the Philippines, while there are recorded reductions in buffalo population, the rate of decline was not as drastic. In fact, there were recorded recovery peaks between 1990-2000, until 2010.

Table 3. Selected SEA Countries with declining swamp buffalo population, 1960-2013

Country	Year					
	1960	1970	1980	1990	2000	2013
Indonesia	2,893,280	2,885,000	2,457,000	3,335,080	2,405,280	1,484,000
Malaysia	345,151	310,402	285,339	205,163	142,042	120,000
Philippines	3,452,000	4,431,500	2,870,270	2,764,950	3,024,400	2912,842
Thailand	4,963,580	5,734,500	5,650,790	5,094,270	1,711,570	1,219,000

Source: FAOSTAT, 2015

The decline in population of draft buffaloes due to mechanization in fast industrialising countries, such as Taiwan, Malaysia, and Thailand, is easily understood. In those countries, the phase of industrialization is faster than that in agriculture. As clearly manifested in the significant decline in the contribution of agriculture in the entire economy, ranging from only 12.0% in Malaysia to as low as 1.6% in Taiwan.

What is interesting to note is the case of China, a country whose agriculture contributes only by 9.7% to the total economy and yet is a country with the highest growth in swamp buffalo population. Elsewhere in South East Asia countries with positive growth in buffalo population are those with greater contributions of agriculture to their total economy, and ranged from 20% in Vietnam to as high as 43% in Myanmar.

Why some farmers shy away from raising buffaloes

Small holder farmers' decision, including that related with raising swamp buffalo, is not purely monetary. Some important factors may give clues to better understanding this issue. These are:

a) Ageing farmers - Majority of farmers directly engaged in small-holder mixed farming in Asia system are above 50 years old. They are ageing. They may retire from working in the farm and would expect younger replacement. On the other hand, the younger generation of farmers, if given opportunity, tends to move out of their farming environment and seek out off-farm employment. This is particularly true for those who have gone through college education. Other than the fact that farm work is less attractive to them, the low level of income generated from small landholding is a major factor.
b) Poor access to capital. Not all small-holder farmers have the willingness to grow from subsistence farming to entrepreneur mode. But for those who may have the willingness, access to ready capital to improve the system and grow from subsistence level is a major limitation. This is particularly true in the case of the need to acquire new farm input, e.g., dairy animal. Unless there is special government program directed to dairying, poor farmers find access to new animal unit difficult. But even given the opportunity to avail of new input, as in the case of dairy animal, only about 47% are considered to have changed mode from subsistence to entrepreneur, as the case in Philippine experience (PCC, 2013).
c) Farming convenience - Older farmers, just like the younger generation who stay in the farming setting due to lack of education and other off-farm employment option, also

embrace convenience. Tending their small land holdings, they find means how to carry out farming tasks more conveniently. Mechanization is very attractive to them, and given access, such as government support for mechanization program, they readily adopt it.

d) Market price of buffalo-derived product - When swamp buffalo is raised purely for meat, one consideration in countries with slaughter ban, such as the Philippines, is the depressed price of buffalo meat vs cattle. This is related to the policy of promoting availability and usage of draft buffaloes during the early 60's, the period when farming was largely dependent on draft animals. Such policy only allowed slaughter of male after age of 7 years old, and female after 11 years old, the objective was to allow females to reproduce and be used for farm work and males to be use for draft during their reproductive life.

Such policy created the impression that buffalo meat is very tough, essentially because what legally available meats in the market come were from retired and old work buffaloes. Up until this time, the consuming public has considered buffalo meat second class to beef, and thus is priced much less. For this reason, in the Philippines, raising buffalo purposely for meat is less attractive than cattle. It may take some time to change consumer's negative perception of buffalo meat, even long after the removal of the slaughter ban policy. Some farmers sell their buffaloes and buy beef cattle for raising purposely for meat.

Technical issues about crossbreeding swamp x riverine buffaloes

Chromosomal Analysis of Water Buffaloes and their Crosses - The interest among scientists in the past has been anchored on the known fact that swamp and riverine buffaloes have different chromosome numbers: the diploid chromosome number of the swamp buffalo is 48 while that of the river buffalo is 50. The general apprehension was based on other animal species of different chromosomes crossbreeding data indicating fertility problems among resulting offspring.

When crossbreeding between the 2 buffalo types occur, males and females of the F_1 generation are heterozygous for the fusion with chromosome 2n=49. Of these chromosomes, 3 chromosomes included one metacentric, one sub-metacentric and one telocentric chromosome were not in pair. Through the G-band analysis, it was demonstrated that the metacentric chromosome in the three unpaired chromosomes belonged to the chromosome 1 of swamp buffalo, and the other two chromosomes correspond to chromosomes I and 9, respectively, from river buffaloes, which may be homologous as they had G-band type (Huang, 2006).

Inter-se mating of FI produces F2 hybrids of three different karyotype categories *(2n=48, 2n=* 49 and *2n=50).* Chi-square tests on pooled data indicated that the distribution 1:2:1 ratio is expected if only balanced gametes with 24 and 25 chromosomes are produced by the FI hybrids. Backcrosses (75:25) produced out of mating FI (50:50) with swamp buffalo karyotype categories are *2n=48* and *2n=49.* On the other hand, if FI (50:50) is backcrossed with riverine buffalo the resulting F2 (75:25) has karyotypes of *2n=49* and *2n=50.* In the three- quarters swamp and three quarters river types, the respective karyotypic categories are in ratios approximating 1:1. The distribution of chromosome categories among the F2 hybrids and backcrosses suggests that only genetically balanced gametes of the FI hybrids are capable of producing viable F2 and backcross generations (Bongso et al. 1983).

In China, three-way crossbred hybrids were obtained by crossing swamp buffalo x Murrah x Nili Ravi or swamp buffalo x Nili Ravi x Murrah. They had two chromosome

categories viz. 2n=49 and n=50, respectively. The two types of karotype exist not only in the progenies of three-way crosses, but also in the F2 hybrids and F3 hybrids of grading crosses. It could be observed that during the meiotic division, the FI hybrid with 2n=49 chromosomes produced 24 synaptonernal complexes (SC), which consisted of 22 divalents, autosome trivalent and a XX divalents. During the synapsis, the rneme 1 from swamp buffalo undergoes partial alignment with submetacentric chromosome 1 and telecentric chromosome 9 from river buffaloes. The synapsis is kept up until metaphase 1. The disjunction occurred during anaphase 1 when it was observed that the metacentric chromosome 1 from swamp buffalo was pulled on one pole to another pole, which resulted in production of two types of sperms viz. n=24 and n=25, respectively. The male river buffalo (2n=50) produced only one type of sperm (n=25). Therefore, the hybrids of three-way crossbred and FI and F2 grading crossbreed hybrids had two types of karotypes viz. 2n=49 and 2n=50. The ratio of the types of karotypes was near 1:1 in the hybrids of three-way crossbred and the FI grading crossbred hybrids (Huang, 2006)

Dai et al. 1994, described the Synaptonemal Complexes (SC) karyotypes of swamp, river and hybrid water buffaloes as follows: a) *2n=50 group (river and ¾ river)* - Among the autosomal bivalents, there were five sub-metacentric and 19 acrocentric SCs. There were six NOR-bearing bivalents: two sub-metacentrics, one large and three small acrocentrics. The nucleoli were located at telomeres of these SCs. The mean absolute length of SC karyotype was 214.4µm *(n=27,* SD=32.4) for the river buffalo and 195.9 um *(n=333,* SD=31.4) for the % hybrids; *2n=48 groups (swamp, F_2, and ¾ swamp)* - The autosomal bivalents included a metacentric (the longest SC), four sub-metacentric and 18 acrocentric SCs. Five nucleoli were terminally located on one sub-metacentric, one large and three small acrocentrics. The mean absolute lengths of SC karyotype were 171.8 µm *(n=20,* SD=27.1) for the swamp buffalo and 186.9 um *(n=48,* SD= 30.1) for the hybrids; *2n=49 group (F_1, F_2, and ¾ swamp)* – There were four sub-metacentric and 18 acrocentric autosome bivalents, and a trivalent. The trivalent was composed of a metacentric, one NOR-bearing sub-metacentric, and one acrocentric. Six nucleoli were located on a sub-metacentric and four acrocentric bivalents, and the trivalent. The mean absolute length of the SC karyotype for all *2n=49* hybrids was 194.9 urn *(n=65,* SD + 25.3).

Among the F2 and ¾ swamp bulls, those with a karyotype of *2n=49* has a higher abnormality frequency (63-68%) than those with *2n=48,* not significantly different from the F_1 (73%). The frequency of abnormal configurations caused by interactions among non-trivalent SCs was lower in the *2n=49* group than in the *2n=48* and *2n=50* hybrids, confirming that when a trivalent is present in the karyotype the asynaptic regions on the autosomes or the X and Y tended to interact with the trivalent (Dai et al. 1994).

International movement of riverine buffalo germplasm into SEA

The introduction of riverine buffalo genetic materials into distinctly swamp buffalo populated countries of China and South East Asia started as early as 1917 in the form of both live animals and frozen semen (Table 4 and 5) as cited by Balaine (1988). Most of the breeds infused are Murrah Buffalo from India and Nili-Ravi from Pakistan.

It is interesting to consider that these early introductions of riverine buffaloes in China and South East Asia have resulted in crossbreds, either by way of natural mating between the introduced breed and the indigenous swamp buffaloes or by AI in the late 60's or early 70's. This observation has been reported to be at experimental scale in Thailand (Konanta, 1986), Vietnam (Thac, 1979; Ly, 1985), Taiwan (Lin, 1975), and in large-scale

crossbreeding program as in China (Xiao, 1988), and the Philippines (Cruz, 2006, 2007). Another interesting account of deliberate crossing between swamp and riverine type buffaloes is in Cuba in the early 1980's. In a span of three years, the Cuban government infused a total of 1,438 swamp buffaloes and 279 riverine type. These animals were crossed to produce F1 and backcrosses.

China and the Philippines are the only two countries in Asia that are pursuing large-scale crossbreeding and backcrossing of swamp buffaloes with the intent to produce critical population of animals with higher genetic potentials for milk and meat production.

Table 4. Recorded introduction of Riverine Buffalo (live animals) in East and South East Asia

Country	Year	Source of Genetic Material	Breed of Buffalo	No. (hd)		
				Male	Female	Total
Philippines	1917-1956	India	Murrah	115	597	769
	1918	India	Nili-Rav			85
	1994	USA	Am-Murrah	70	154	224
	1995-1999	Bulgaria	Bul-Murrah	286	3080	3366
	2010	Brazil	Murrah	11	2027	2038
	2011-2013	Italy	Ital-Medtrn.	29	2334	2363
China	1957	India	Murrah			55
	1974	Pakistan	Nili-Rav			50
Thailand	1962-79	India	Murrah			>100
Vietnam	Late 1970	India	Murrah			
Taiwan	1957	Philippines	Murrah	3	4	7

Source: Balaine (1988); Philippine Carabao Center (2015)

Table 5. Recorded transport of riverine frozen semen to South East Asia

Country	Year	Origin	Breed	# Straw/dose
Philippines	1981-87	Pakistan	Nili-Rav	3000
	1982-85	India	Murrah	3000
	1996-1998	Bulgaria	Bul-Murrah	13,000
Thailand	1979	India	Murrah	1000

Source: Balaine (1988); Philippine Carabao Center (2015)

INTERNATIONAL EFFORTS AND COLLABORATIONS IN THE PHILIPPINES ON SWAMP BUFFALO DEVELOPMENT

The crossbreeding program in the Philippines is a result of various collaborations that involved many international institutions and entities that started as early as 1917 up until to date. These collaborations may be classified into three major areas, namely, genetics, system development and genetic utilization, and promoting enterprises as summarized in Table 6.

The first phase of germplasm infusion that occurred from 1917 to 1956 involved live animals from India. Due to the absence of organized breeding program, the initial purebred dairy breeds that were distributed to several government institutions failed to increase in number as desired. Many bulls were assigned in the breeding centers throughout the country and were used in natural mating. There were also Murrah bulls loaned out to private commercial buffalo farms for crossbreeding purposes.

The second phase of genetic infusion started in 1981, this time through frozen semen of Murrah and Nili-Ravi from India. Organized AI to produce crossbreds for research under the FAO-UNDP project were initiated. Thereafter, the national government started to train riverine bulls for semen collection for use in national AI program.

Through FAO technical assistance, risk assessment for the proposed live animal importation from India was undertaken. In view of the magnitude of animals proposed for importation, an alternate source of live animals, Bulgaria was made. It was in 1995 that infusion of Bulgarian Murrah was started. About 3142 animal (216 males and 2926 heifers), together with 13,000 doses of frozen semen from progeny tested bulls of Bulgarian were imported between 1995 and 1998.

Prior to 1974, a few years after the creation of the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), crossbreeding and backcrossing in the Philippines were limited. The situation changed when serious consideration on crossing swamp buffalo with the riverine type was initiated after the 10-Year United Nations Development Programme-Food and Agriculture Organization (UNDP-FAO) assistance on buffalo R&D was approved and implemented in 1982 to 1992. This 10-year research initiative clearly defined the benefits of crossing the riverine buffaloes (Murrah) (2N=50) with the Philippine swamp (2N=48). The resulting F_1 crossbreeds were found to grow significantly faster than the swamp buffalo and to produce milk three to four times more than the native parents. It was also demonstrated that males and females FJ crossbreds (2N= 49) were fertile. Based on the analyses of breeding and performance records, it is not recommended to pursue an FJ x FJ mating, thus the route pursued and expanded towards the end of the project and onward is the continued backcrossing with the riverine type. Backcrosses with increasing blood composition of the riverine breed registered linear increment in milk yield without detriment to the reproductive and adoptive performances. With these production potentials, the social and economic benefits accruing to rural farmers from raising crossbred carabaos instead of the local breed became pronounced.

On the basis of these encouraging results, the government implemented a national artificial insemination program for swamp buffaloes utilizing frozen semen of selected Murrah sires. And thus, in view of the growing need for frozen buffalo semen for AI, the establishment of the country's first frozen buffalo semen laboratory was initiated in 1984. Estrus synchronization procedures were also developed to permit synchronized breeding

and allowed the coverage of many breed able females, which are scattered quite thinly in the villages all over the country, utilizing the relatively few available AI technicians.

The backcrossing with riverine breed is aimed at producing backcrosses at least at 3rd and 4th generations. The scheme being implemented in China is described below:

a) Swamp (S) x Murrah (M)	b) Swamp (S) x Nili-Ravi (N)	c) Swamp (S) x Murrah (M)
F_1 SM (50:50)	F_1 SN (50:50)	F_1 SM (50 : 50)
SM x M (25 : 75)	SN x N (25 : 75)	SM x N (25 : 25 : 50)
SMM x M (12.5 : 87.5)	SNN x N (12.5 : 87.5)	
SMMM x M (6.25 : 93.75)	SNNN x N (6.25 : 93.75)	

Scheme A is designed to produce "Chinese Murrah", B for the production of "Chinese Nili Ravi", and C for the production of triple cross involving 75% riverine blood and 25% swamp buffalo blood.

Table 6. International collaborations related to transformation of swamp buffaloes from draft to milk and meat in the Philippines

Area	Institution/Entity	Date	Area of Collaboration
Genetics	Govt of India	1917 to 1956	Live Animals, Murrah (854 hd at various years)
		1982 to 1985	Frozen Semen, Murrah (3000 doses)
	Govt of Pakistan	1981 to 1987	Frozen Semen of Nili Ravi (3000 doses)
	FAO-UNDP	1982 to 1992	Research on Crossbreeding between swamp x riverine
	FAO	1994	Risk assessment on importation of live animals from India
	Govt of Bulgaria	1995 to 1999	Live Animal Importation, Bulgarian Murrah (3363 hd various years); frozen semen
	Govt of Brazil	2010	Live Animal Importation, Murrah Breed (2038 hd)
	Govt of Italy	2013	Live Animal Importation. (2363 hd, Mediterranean breed; 4000 straws of frozen semen)
System Development and Utilization of Genetics	Japanese Govt thru JICA	2000 to 2005	Genetic Improvement, AI improvement, Semen Processing
	Australian Govt thru ACIAR	1999 to 2004	Genetic Improvement focused on Animal ID, recording system and data analysis
	Korean Govt thru KOICA	2010 to 2012	Cryobanking of AnGR, DNA-based biotechnology, Semen Processing
	US Govt thru its PL480 Program	2010 to 2013	Research and Development, Biotechnology Laboratories, Human Resource Development
	Taiwan Livestock Research Institute	2008 to date	DNA-based technologies, Screening of Genetic Defects, Cryobanking
	USDA	2012	Human Resource Development focused on Cryobanking of AnGR
	International Buffalo Genome Consortium	2011 to date	DNA-based MAS, Buffalo Genome
Enterprise Development	Japanese Govt thru it 2KR fund	2010 to 2013	Dairy Product Processing, Establishment of Milk Collection Scheme for smallholders
	Korean Govt thru KOICA and KAPE	2010 to date	Product Development, Product Standard, Product Traceability

Performance of Crosses and Backcrosses

Growth and Meat Production

Growth performance of swamp buffalo and their crosses with Murrah breed is shown in Tables 7 . There is no difference in birth weight between the two breed groups, but the growth rate of crossbreds started to move ahead than that of the swamp buffaloes starting at age of 6 months up until 36 months, with growth advantage that ranged from 10-31.1%. At four yearsof age, FI crossbred (50:50) and backcrosses with 75% Murrah blood registered weight advantage of 9.8% to 2 1.4% over the swamp par

Table 7. Live weigth of swamp buffalo and its crosses with riverine breed (kg)

Breed/ Type	N	Age, year	Liveweight	Δ%[a]
Swamp			443	-
Male	79	4-5	398	-
Female	92	4-5		
SBxM (50:50)				
Male	11	4-5	531	19.8%
Female	19	4-5	476	14.5%
SBxM (25:75)				
Male	8	4-5	530	19.6%
Female	7	4-5	479	20.3%
SBxNili (50:50)				
Male	15	4	538	21.4%
Female	18	4	482	21.1%

Source: Faylon, 1992

Tender Buff refers to buffalo meat with desired carcass quality specifications produced in Australia. Rates of weight gain should be from 0.800-l.2 kg/head/day. Depending on starting weights, the required finish and temperament can be achieved over 60-120 day period of feeding, depending on feed quality. In the "wet" season, growth rates of l kg/head/day can be expected from pastures, provided there is ample material available to buffalo (not overstocked) and a maintenance fertilizer program is adopted which supplies at least P and S, and also K if needed. Most of the NT-produced TenderBuff are farm-bred or purchased from other suppliers as swamp buffalo yearlings and grown out for a further 8-16 months to achieve target weights in pastures. The stocks are regularly weighed at 3-month intervals, and then more often as target weights are approached. Batch groups are assembled when 380kg is achieved and then these groups are weighed virtually on a fortnightly basis until turned off. Ultrasounds P8 fat measurements are also taken to ensure fat specifications are met. By this stage, most of the buffaloes are sufficiently yard- trained to go through the QA system without any stress-induced pH problems. The duration of the

feeding period is a vital part of the quartering process to reduce the likelihood of stress at slaughter.

In Australia, Lempke (2004) reported that the introduction of Riverine blood from the USA in 1994-1997 radically altered the productivity of TenderBuff. Growth rates in the crossbred from 3/8 and above are outstandingly greater than the purebred swamp available in the NT. Some 40% improvement in growth rates has been recorded in comparisons. Results from the NT Government Beatrice Hill Farm regularly confirm this trend. The more crossbred carcasses that are processed, the better the production data becomes. An example from 2003- 2004 Tender Buff slaughtering is tabled below (Table 8).

Table 8. Tender Buff slaughtering data

Parameter	Swamp	River Crosses	% Difference over Swamp
No. of Animals	52	24	
Mean HSCM (kg)	224.6	258.9	15.3%
Eye muscle area (cm^2)	57.1	70	22.6%
Mean pH	5.54	5.51	-1%
Mean carcass length (cm)	104.0	108.6	4.4%
Mean grid $/kg	$3.05	$2.96	-3%
Mean p8 fat (mm)	7.1	10.0	41%
Mean dressing %	51.2	51.7	1%
Mean price $	$686.07	$768.68	12./%

Source: Lempke, 2004

Milk Production

Chinese swamp buffalo has generally low milk production between 500-800 kg/lactation (Yang et al., 2007). However, selected Chinese swamp buffaloes have higher milk yield, as in the case of animals at government institutions where recorded average milk production is 1,092.8 kg/lactation. Under similar conditions, purebred Murrah and Nili Ravi milk yield/lactation were reported to be 2, I32.9kg and 2,262.1 kg, respectively (Yang et al. 2004).The F_1 crosses of swamp buffalo with Murrah breed had an average of 1,233.3 kg milk/lactation, equivalent to 12.3% increase in milk production. In the Philippines, the recorded yield of swamp buffalo x Murrah crosses is 4.14 kg/day and represents 176.0% increase, mainly because the milk yield of Philippine swamp buffalo is only 1.5 kg/day on the average. On the other hand, Chinese swamp buffalo crossed with Nili Ravi registered milk yield of 2,041.2 kg/lactation, an increase of 86.9% over the swamp buffalo parents.

Backcrossing the (MxNL) F1 with Murrah or NL F1 with Nili Ravi resulted in milk yield of 1,585.5 kg and 2,267.6 kg/lactation, respectively. Clearly, the backcrosses with 75% riverine bloodline have higher milk yield than FI crosses. Among the Murrah backcrosses, the increase over the swamp parents is 45% and 28.5% over the F1 cross. Similar trend is

demonstrated among Nili Ravi backcrosses, with reported increases of 107.5% compared to swamp parents and I 1.0% compared to LF I crossbreds (Table 9).

Table 9. Milk production parameters of different pure breeds, crossbreds and backcrosses

Breed	Head	Lactation	Lactation length (day) X±S CV%	Milk Yield X±S(kg) CV%	Average milk yield per day (kg)	Corrected 305- day milk yield X±S(kg) CV%	Highest daily milk yield (kg)
L	70	70	280.4±20.2 72	1092.8±207.4 4 19.0	3.79		6.60
M	65	237	324.7±73.6 22.7	2132.9±578.3 27.1	6.57	2117.1±430.0 20.3	17.40
N	58	164	316.8±76.1 27.2	2262.1±663.0 29.3	7.14	2366.4±51.6 23.7	18.40
MLF_1	73	241	316.8±76.1 27.2	1233.3±529.7 42.9	4.40		16.50
MLF_2	16	54	303.2±83.1 27.4	1585.5±620.6 39.1	5.22		13.00
NLF_1	6	45	326.7±96.4 29.5	2041.2±540.9 32.4	6.25	2060.7±386.2 18.7	16.65
NLF_2	9	20	325.8±93.2 28.6	2267.6±774.8 34.2	6.96	2298.4±6044. 4 26.4	18.37
$NMLF_2$	45	168	317.6±78.4 24.7	2294.6±772.1 33.7	7.22	2348.0±533.2 22.7	18.80

Source: Yan et al. (2004), Zhang (2006)
L=Local swamp buffalo; M=Murrah; N= Nili Ravi;

INSTITUTIONALISATION OF THE PHILIPPINE BUFFALO DEVELOPMENT PROGRAM

The program of transforming the Philippine swamp buffaloes to producers of milk and meat was institutionalized after the establishment of the Philippine Carabao Center (PCC) through Republic Act 7307, known as the "Philippine Carabao Act of 1992" and in China, after the establishment of the Guangzi Buffalo Research Institute in 1958. The components of the Philippine national program, are herein discussed.

Establishing the Ground for Genetic Improvement

The fundamental initiative that is most consistent with the envisaged improvement in the productivity of the swamp buffalo is the establishment of gerrnplasm pools from where superior materials can be obtained on a sustainable basis. Efforts along this line have yielded concrete results, as follows:

a) *Gene Pools for Selected Native Philippine Carabao (PC).* While exotic germplasm were introduced for the specific purpose of improving milk and meat, the government also ensured that the existing swamp buffalo germplasm are conserved for long-term genetic improvement program. The general premise is that through the years, domestic stocks of swamp buffaloes have adapted to the local conditions and therefore there are certain genes that can be very useful for future breeding and genetic improvement. Gene pools for the Philippine carabao were established in the three main islands of Luzon, Visayas and Mindanao. The animals are kept as Open Nucleus Herds (ONH), and selection of better stocks from thc surrounding communities is done on a continuing basis. Selected animals outside of institution herd are taken in and shall form part of the ONH for the Philippine carabao. These animals have been chosen primarily for size, growth rate and reproduction ability.

   There is also a swamp buffalo sanctuary in a separate island that is so well protected from the introduction of any exotic germplasm of buffalo of any form. Farmers are utilizing the indigenous buffaloes for their farming activities and this will certainly be carried through for many generations to come. Monitoring of the animals is regular.

b) *Gene Pool for Improvement for Milk Production.* Elite herds of "Bulgarian Murrah" are reared at the National Riverine Buffalo Gene Pool and at two separate institutions in Central and southern islands of the country. Animals with outstanding performance at farmer-cooperatives are also enrolled as part of the gene pool. With organized selection and testing system in place, the country is now assured of sustained sources of genetic materials for improvement of milk production. The system can produce about 400 bulls of good quality per year, with the top-ranking bulls subjected to progeny testing and then assigned as semen donors for use in the nationwide Al program, while the above-average bulls are used in the wide-scale bull loan for crossbreeding and backcrossing in the villages.

c) *Genetic Evaluation System.* Breeding research that aims to improve the milk production potential of the riverine buffalo population in the country is carried out by putting in place a system of ranking and selecting the best animals. This is done by developing a BLUP animal model for determining the genetic merit of individual animals with milk production record. Initially, evaluation of cows was based solely on milk volume, but starting in 2005, milk fat and protein percentages were included as additional traits in the evaluation. The model for genetic evaluation, including the software, was developed in collaboration with the geneticists of the Animal Genetics and Breeding Unit (AGBU) and the Agri-Business Research Institute (ABRI) of the University of New England in Armidale, Australia funded by ACIAR.

d) *Embryo Biotechnology Laboratory.* Attempts to hasten the envisaged genetic improvement have also led to the development of facilities and reproductive biotechniques that can be used as important tools in some specific areas not normally achieved through the traditional breeding techniques. To date, the facilities established at the PCC Central Research Station have developed technologies to produce high genetics embryos through the in-vitro system. These efforts are complemented with ovum pick-up procedures, obtaining oocytes from superior donors for IVM/IVF as an alternative option to superovulation scheme that proved to be less predictable and more expensive.

e) *Use of DNA-based biotechniques as a tool for genetic improvement.* The completion of the buffalo genome project and the development and availability of 90,000 SNIP chip has also facilitated the selection of genetically superior animals for milk production.
f) *Cryobanking of Animal Genetic Resources.* Genetic materials in the form of frozen semen, embryos, DNA and tissues are also collected from distinctly different breed groups and lines as well as from outstanding animals in the gene pools and are cyropreserved and stored in the gene bank.

Included in the gene bank are samples collected from livestock species such as indigenous cattle, goat, sheep and the Tamaraw (2n=46), an animal within the buffalo family that is classified as an endangered species and is found only in the Philippines.

Expanding Usage of Superior Germplasm

The utility of superior genetics obtained from the sustained selection and testing efforts is expanded by using females as dams of future sires while proven sires are used for AI. Outstanding sires tested and selected from the gene pool have been fully harnessed as semen donors in order to cover as many native swamp buffaloes as possible to effect the desired genetic improvement. Component activities/strategies on how to expand usage of superior genetics are as follows:

a) *Semen Processing Laboratory*. The country established semen processing facilities as early as 1984, and to date, such facility houses 50 semen donors and 15 junior bulls for testing each year About 300,000 to 350,000 frozen semen from progeny-tested bulls are produced annually sufficient to meet the national requirements, including those of AI technicians of all local government units (LGUs) and non-government associations (NGOs) as well as private AI technicians.
b) *Intensified Artificial Insemination and Bull Loan Program*. In cooperation with the Local Government Units (LGUs), crossbreeding and backcrossing of swamp buffaloes with the dairy breed t is carried out nationwide. This system has current annual Al service coverage of about 200,000 head. As a way of government subsidy to the genetic improvement program, frozen buffalo semen are provided free of charge up until now. However, as the scheme to privatize the Al services is gaining acceptance, frozen semen are provided to private Al technicians at cost. Provision of liquid nitrogen to preserve quality of frozen semen is at the shared account of national and local governments, but will likely be provided at a later stage at cost to private technicians who, in turn, charge for their services at a reasonable rate.

In the past two years, efforts were directed at privatizing the Al services by developing village-based private technicians (VBAIT) in order to augment the limited AI technicians of the national government agencies and the local government units. Based on the data so far, these private AI technicians are more cost- efficient and more responsive in many respects compared to LGU technicians. Their main advantage is their constant presence in the village service area and their "pay-per-service" system that releases the government from costly subsidies in the form of salaries and allowances. Under a condition where animal ownership per farmer is only I to 3, and households are scattered widely in the rural communities, it appears that harnessing VBAITs offers many advantages. In communities where advanced stage of privatization has been achieved, Al technicians are also trained as para-vets and they are also organized. As a group they source their AI supplies, including liquid nitrogen (LN2) and frozen semen at cost.

The AI is augmented with the bull loan program, which is undertaken in villages where AI services are not available. In fact, even in some areas where Al services are accessible, many farmers have high preference for natural mating, owing to very good success rate in this method compared to AI. On the average, the national Al system has registered a success rate of only 30.0% first service. Subsequent services, of course, can result in higher percentage of calves on the ground, but much higher rate is obtained in single service under natural mating. A system of incentive is offered to farmers tending breeding bulls in the village wherein full ownership of the bull is awarded once the bull has sired at least 50 calves. Many farmers get their bull ownership in just a period of 2 years. In service areas of both AI and bull loan, the important consideration is to avoid inter-se mating of crossbreds. This is achieved by programmed castrations of all males in the field and ensuring that semen for AI and bulls for natural service are of purebred riverine buffalo genetics.

What has been avoided so far is the inter-se mating of F1 *(2n* = 49) as there are resulting F2 offspring with undesirable phenotypic performance, more practically noted on F_2s with *2n* = 48. As a measure in the Philippines, crossbreds and backcrosses males are readily castrated and are destined for draft or for meat purposes.

The assignment of purebred riverine bulls in impact areas without AI services with the corresponding program to castrate the non-purebred males have guaranteed sustained backcrossing, generation after generation. Of course the program of purebred riverine bull assignment in service area is for a maximum of 4-5 years only, thereafter, bulls are either replaced or rotated to another service area, to avoid potential father to daughter mating.

Support to Establishment of Buffalo-Based Enterprises

Two approaches are being introduced in areas considered to be Impact Zones for the project. These areas are considered as such in view of the density of breeder stocks in the community. In these communities, massive AI services are carried out with the intent of producing critical number of crossbreds, all of the crossbreds and backcross males are for meat or for draft and females are retained as potential dairy animals. While this activity covers many animal raisers, the process is relatively slow owing to the long gestation of buffaloes and their late maturity. As a way of "shortcutting" the process, incubator modules composed of purebred buffaloes are introduced in the impact areas. These modules serve as show window for the farmers to see and appreciate the benefits of rearing the correct animal and adopting the proper management and breeding practices. In the impact areas, carabao raisers have been organized into cooperatives to collect, process and market milk and milk products in a systematic manner. Support to these cooperatives takes the form of organizational as well as technical trainings and the provision of post-production equipment, mostly to preserve the quality of the milk and assistance to market access.

In the National Impact Zone (Nueva Ecija), primary cooperatives involving thousands of families have formed into the Nueva Ecija Federation of Dairy Carabao Cooperatives (NEFEDCCO) to supply milk and dairy products to major urban markets. Throughout the country there are 13 regional Impact Zones.

RESEARCH AND EXTENSION

Implementing development program is not easy, more so when dealing with millions of smallholders who are scattered thinly over a wide geographical area. The case of

crossbreeding and sustained backcrossing of swamp buffaloes is a concrete example. Introducing new technologies and methodologies such AI and use of superior genetics, animal recordings, applicable and practical husbandry practices for the "new animal", organizational concerns, among myriad of other matters require applicable research and extension strategies. In the Philippine experience, we simply let the program be carried out as planned, and even how best the planning has been, along the program implementation, there certainly will be constraints and problems to be encountered. Often, these constraints/limitations can be addressed by either policy, extension or research. The researchable area is then the subject of operational research. In several instances, the problem is extension approaches, finding the appropriate mode of tech delivery. At some point, there is a need to carry out basic research, but such is directed basic research to solve some technical problems directly related to the program. It took some time for the scientists to shift from the traditional 'academic type' research which are imprinted during the graduate school years to more applied and directed type of research.

CONCLUSION

There are compelling social and economic reasons for the decision to pursue wide-scale crossbreeding and continuous backcrossing of swamp buffaloes with the riverine buffaloes in countries such as China and the Philippines. While there were apprehensions about the technical feasibility of carrying out such wide-scale efforts, first because of the differences in the chromosome numbers of these two buffalo types, and second, by the initial data about chromosomal behavior suggesting some potential reproductive abnormalities, performance of both male and female F1 crossbreds and their backcrosses obtained in the field have shown otherwise.

For wide-scale crossbreeding and backcrossing program to succeed, the mechanism needed for its implementation has to be institutionalized primarily because of the length of the required period, at least 15 to 20 years to achieve results of 3 to 4 generations of backcrossing. The establishment of the Philippine Carabao Center in the Philippines that necessitated legislation of national policy is an example of institutional instrument needed to ensure sustained efforts throughout.

In the final analysis, the results of this genetic transformation of swamp buffaloes will find more meaning if the "new animals" designed to produce more milk and meat are fully utilized to benefit millions of farming families. The system should also recognize the requisites for "business sizing" the smallholders, raising them from subsistence way of husbandry to the level of entrepreneurship.

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Solving Food Security Problems Through Ideas, Creativity, Innovation and Commercialization (ICIC) Ways in Tropical Animal Production Systems

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ABSTRACT

This paper attempts to apply system thinking in solving food security problems especially in tropical countries. System thinking is synonymous with ICIC ways which means *Idea, Creativity, Innovation, and Commercialization*. Through ICIC ways agriculture production systems can be efficiently managed and sustainable. In order to solve food security problems we need to consider 3Ps (people, planet and profit) aspect of development. Three examples will be used to explain ICIC approach are livestock-crop plantation (LICRO) integrated production systems as a future animal production system in the tropics, oil palm fronds (OPF) as a fiber source for herbivores feeding and dehydrated-processed food waste (DFW) as an ingredient in poultry feed formulation for free range system. This paper will apply system approach to solve some of livestock production problems such as limited grazing land space for ruminant (cattle, buffalo, goat, sheep and deer), utilizing readily available green fiber source (waste) such as OPF as herbivore feedstuff and re-utilize food waste (processed and dehydrated) from restaurants, hospital canteens, hotels and others as replacement for expensive imported feed grains in poultry feeding management. Food security problems in term of low in self-sufficiency level in animal protein food such as meat and milk from ruminants and egg &poultry meat can be solved efficiently and economically through application of appropriate technology and innovations. All problems can be turned into opportunities through ICIC ways; not only solving primary problem of resource scarcity but also contributes towards multiple output and commercialization of animal protein food items and animal products from the system.

Key Words: Food Security, System Thinking, Idea, Creativity, Innovation, Commercialization, Integrated Livestock-Crop Plantation System, Oil Palm Frond Fiber Feed, Food Waste as Feed

INTRODUCTION

There is an obvious need to boost food and livestock production in the tropics; firstly, because an enormous expenditure is entailed in importing food and feedstuffs especially grains for human and animal. Secondly, because of the demand for food commodities (including livestock products and feedstuffs) will be expected to grow at a rate commensurate with that of the population. In order to ensure food security, food and farming policy of the country should be sustainably managed (Lang and Heasman, 2004). Most of tropical countries have green and productive vegetation whole year round, due to no distinct seasonal variations. Thus, tropical countries such as Malaysia, Indonesia, Thailand, Philippines and others can be the future "food bowl of the world". But, at the same time animal-agriculture is not their main farming activity as in most of developed countries. Currently, animal production must increasingly compete with other forms of production for resources, especially energy (feed sources), but also for land, water, finance and labour (Dahlan, 2009; Baker, 2006). This creates a greater need to develop systems which maximize efficiency (Dahlan, 2000;Baker, 2006). Sustainable animal production; Must be environmentally beneficial, ethically defensible, socially acceptable and relevant to the particular aims, needs and resources of the community they are designed to serve (Gallopin and Raskin, 2002). They should also

be sustainable with the dynamic changes of the agricultural systems (Spedding, 1996;Dahlan, 2002).In order to solve food security problems we need to consider 3Ps (people, planet and profit) aspect of development.

Objectives of this paper are to explore the sustainability of animal-agricultural production systems in the tropics in relation to the availability of resources, system of farming or production and marketing systems and to evaluate recent development in animal-agricultural production in tropical countries especially Malaysia through system approach or idea, creativity, innovation and commercialization (ICIC) ways.

System thinking process can be conceptualized as ICIC ways (Fig. 1). Food security problems can be solved through getting ideas (I) by using SWOT analysis -*strength* (have factors), *weakness* (do not have factors), *opportunity* (will have factors) and *threats* (constraints or will not have factors). Followed by creativity (C) through finding new or alternative ways and innovation (I), through development of appropriate technology and invention. These processes will be more meaningful and worth through commercialization (C) of research output or products.

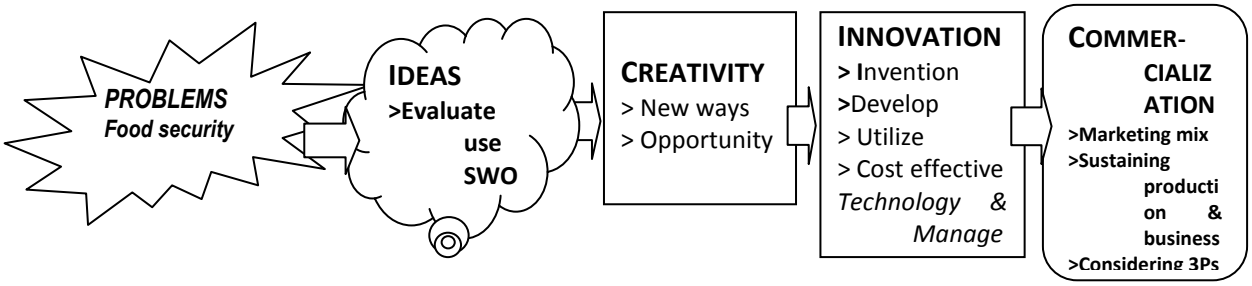


Fig. 1. Conceptual model of solving food security problems through ICIC ways.

Sustainability

Sustainable agriculture implies a system that is in balance (Kang, 2007). The sustainability of animal-agricultural systems should be evaluated in terms of their ability to balance the inputs and outputs of biological, ecological, economical and sociological considerations in the long term (Bell and Morse, 2003). The real issue of sustainable agriculture in the tropics is the one that must work towards a sustainable future where agriculture is considered within the broader context of sustaining the quality and quantity of life on earth (Spedding,1996;Kang, 2007). It is society and people within it that we want to sustain (Barbier *et al,* 1995). A more sustainable agriculture would be the one that bring benefit into the future.

Spedding(1996) stated that essential attributes of future agricultural systems should be *highly productive, of safe, high quality products* (within identified constraints), such as;

a) They should be *physically sustainable* (i.e., use physical resources at rates or in ways which allow adequate long-term development).
b) They should be *biologically sustainable* (i.e., the biological organisms and processes on which they depend must be sustainable in the long term) – this could encompass the avoidance of 'internal' pollution, such as the build-up of heavy metals.
c) They should *satisfy agreed standards for human & animal welfare.*
d) They *must not give rise to unacceptable pollution, by-products or effects (including visual).*
e) They *must be profitable* (since they will not be practiced if they are not) - this also assumes that the products are wanted (otherwise there will be no demand and the business will collapse).

Animal-agriculture is recognized as the main producer of animal protein food for the nutrition of the world's population. Asian farmers, livestock producers and entrepreneurs should consider animal-agricultural production as one of the fundamental sources of income and wealth creation rather than subsistence type of ventures, and make it part of their main business activity.

Sustainable animal-agricultural production in this region requires some changes that are appropriate to their unique and integrated production systems.

Agricultural industry and land use

Increases in agricultural production in the past have been due to expansion of cultivated areas. Agricultural development is practically synonymous with land development. Oil-palm, rubber and rice are the major crops and oil-palm products and rubber each contributed significantly to Gross Domestic Product (GDP). Rapid rate of industrialization and growth of the non-agricultural sectors, course the proportional contribution of the agricultural sector to GDP declining. Agriculture continues to be a supplier of food and a significant source of rural employment and the main national employment of developing countries. More serious thought has to be given to planning agricultural development in these countries. This would include systematic policy and efficient management of land resources for increasing agricultural productivity at farm levels, as well as conserving forest resources for future generations (Lang and Heasman, 2004;Dahlan, 2000).

Contributions of animal-agriculture

Animals provide protein foods – a complete food (meat, milk, egg) for human diet. Animal protein contains most of the essential nutrients for the human dietary requirements in term of amino acids, fatty acids, minerals, vitamins and energy. Animals also provide items of pharmaceuticals, biological (hormones, antibodies, vaccine, enzymes, etc), cosmetic and mineral supplements (Dicalcium phosphate-DCP, Fe, Na, etc). These products are essential for human nutrition especially for growth, health maintenance and normal body function. Other contributions; *Draught power* – for ploughing, pulling cart, transportation e.g. pulling oil palm fresh fruit bunch in plantation using buffalo, *equipment, tools and clothing*– bone tools, wool, leather, hide, skin, etc, *Fertilizer* – from faeces, urine and abattoir by-products and waste, *Biological recycle machine* – utilizing agricultural by-products fibrous material as feeds (ruminants and herbivores), *Biological weeder* – cattle, sheep, deer and others grazing weed in plantations, *Recreations* – main component in bio-parks and agro-tourism activity, pets, hobbies, sports, games and etc, *Biological experimental animal* – testing drugs, vaccine and diseases, development of vaccines and antibodies, and sentinel animal, and *Bio-fuel*– bio-gas (methane gas) from intensive livestock production systems.

Animal-agricultural industries also contribute towards national food security. This is accomplished in two ways;

- Provides adequate important food items for the country and
- Reduces the import of food items and forex outflow to other countries.

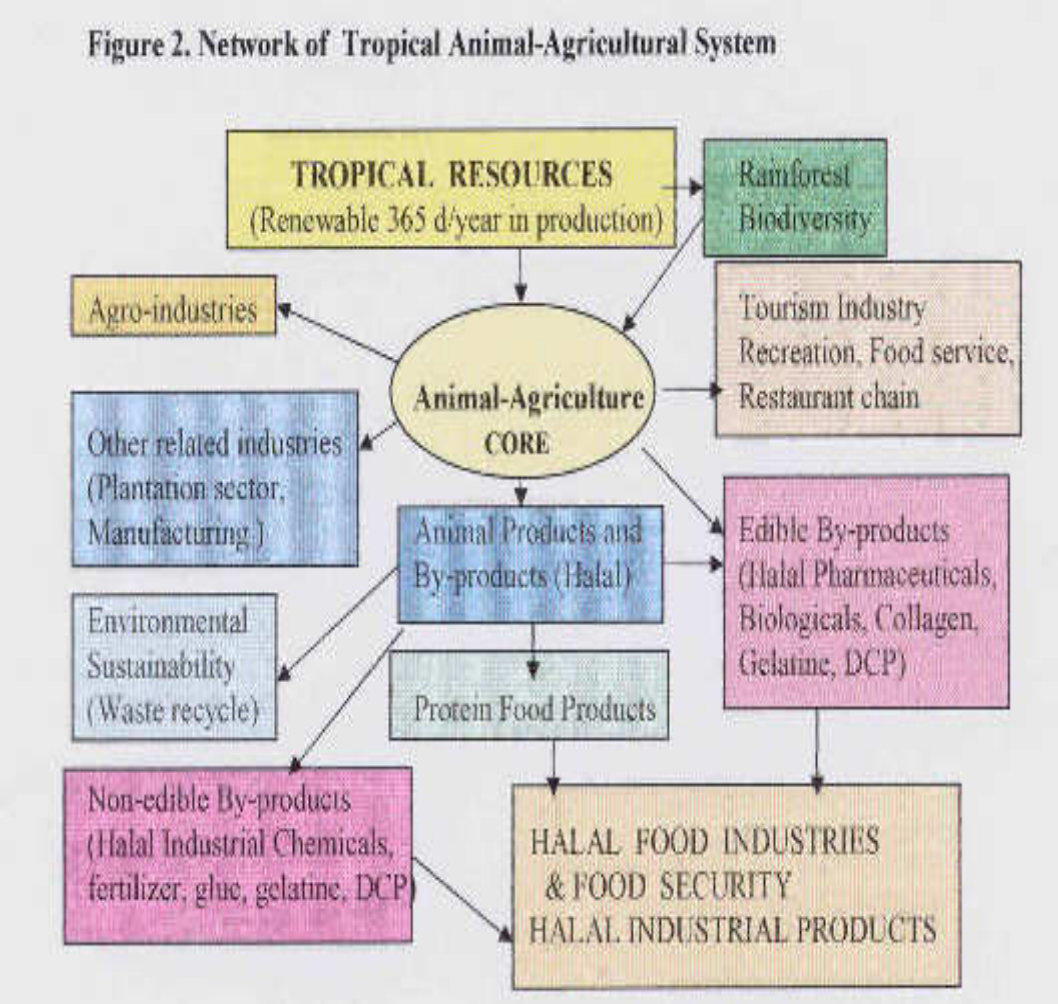
This diminishes country over-dependency on foreign producers.

Animal-agricultural production linkages

Animal production has great opportunities in Malaysia, especially in the ruminant sector. Animal-agriculture can be the core industry that can be linked to other important industries and act synergistically to effectuate more efficient dynamic production, manufacturing and service systems. The involvement of animal-agriculture in plantation sectors such as oil palm plantation can be in the form of integrating ruminants into the plantation and utilizing oil palm by-products as their feedstuff. Involvement in tourism industry will be in the form of halal and quality food service, animal recreations and provide a unique bio-parks and biological services (Dahlan, 2002; Dahlan *et al.*1994). One of the most important contribution of animal-agricultural production is in providing halal quality products (food, pharmaceutical, cosmetics, biological, industrial biochemicals, etc) for the Muslims. Because of the high demand for halal and quality products especially in food industries, synergistic merging of related industries should be encouraged (Fig.2).

New approach in animal production and industries through venture into downstream processing such as processing of by-products for high value products will become more efficient and profitable industry. Hi-tech halal bio-materials such as dicalcium phosphate from bone, collagen and

gelatin from skin, suture catgut from esophagus and others will turn low value items into expensive products.



Potential areas for future animal-agriculture in the tropics

- Licro – **Li**vestock-**cro**ps plantation integrated production systems (Dahlan, 2009;Dahlan and Kamal Hisyam, 2014;Dahlan-Ismail and Dawend-Jiwan. 2015).
  >>Especially *ruminants – oil palm, rubber & agroforestry integrated production systems*
- Utilization of agricultural by-products (ABP) and food waste as animal feed & bio-industries (Dahlan I. 2013;Dahlan *et al.* 1992;Nadia et al. 2014; Hossein & Dahlan, 2015).
- Rearing livestock for other activities – multiple output concepts in production.
  >>Recreation, conservation and agro-tourism (Dahlan et al. 1994;Dahlan I. 2009; Dahlan & Iskandar, 2013).

Integrated production systems

Livestock-**cro**ps integrated production systems (LICRO) are complex agricultural systems that comprising many interacting components. Complex LICRO systems comprising components such as tree crops plantation systems, management systems, animal production systems, and others, cannot be successfully handled within the confines of a single discipline (Dahlan-Ismail, 1993).

A multidisciplinary approach is needed. If agriculturalists and decision makers ignore the ecological setting of integrated farming systems, the result will be harmful exploitation of the natural environment. Ecological concept can be easily incorporated into decisions about resource management in LICRO systems. Sustainable development approach (Fig. 3) should be followed in

order to develop sustainable animal-agricultural industry in the plantation sectors (Dahlan, 2002; Campbell & Sayer, 2003).

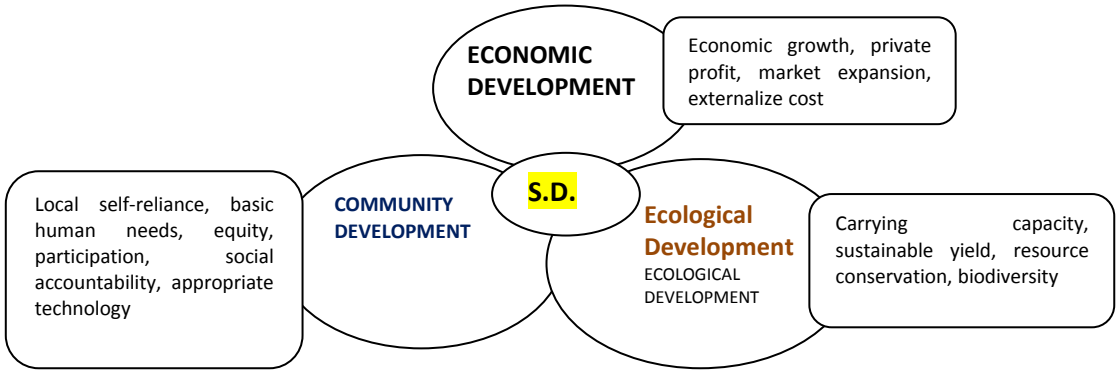


Fig.3. Sustainable development (S.D.) concept for integrated production systems

New concepts need to be created, explored and introduced for agriculture to remain competitive with other industries in developing (tropical) countries. The new millennium approach for agricultural production systems in most of tropical or developing countries in the world must be based on an integrated approach (Campbell & Sayer, 2003). Efficiencies and economies will come by sharing land space, labor, management, professionals, products and by-products utilizations, and infrastructures for production of multiple commodities and activities (multiple output concept). Grazing animals on land used simultaneously for crop production is commonly known as integrated or 'land-sharing' livestock-production system (Fig.4a, 4b, 5 and 6). Similar systems for the production of timber and food crops or animals on the same land unit are called 'agro forestry' (Dahlan, 2002;Dahlan, 2005; Dahlan & Dawend, 2013;Dahlan Ismail & Dawend Jiwan, 2015). This system offers great promise and has several advantages, such as improved fertility of the land via the return of dung and urine, control of waste herbage or weed growth and reduced use of herbicides, easier management of the crop and distinct possibilities of increased crop yields, the sale of animals and their products adds to the returns from the systems. In other words, this system offers more efficient resource utilization. Other advantages; The development of livestock through integration with plantation crops such as oil palm, rubber, coconut, and forest replantation such as acacia show particular promise (Dahlan, 2005; Dahlan & Kamal Hisyam, 2014). The system provides feeds such as the undergrowth or ground vegetation which forms part of the ecosystem of oil palm, rubber, coconut and acacia plantations, the most critical factor in ruminant production, may be made available at a much lower cost than the other conventional, monoculture animal production system or other extensive (open pastures) animal production systems (Awaludin, 2000). The canopy provides shade that reduces the heat stress problem facing animals in the tropics. Extra activities such as agro-tourism can be included in the production systems (Dahlan, 2009; Dahlan & Iskandar, 2013).

Fig.4a. Cattle under "old" oil palm plantation.

Fig.4b. Sahiwal-Friesian cattle in "young" (> 3 years old) oil palm plantation

Fig.5. Sheep grazing in oil palm plantation

Fig.6. Timorensis deer (*Cervus timorensis*) in oil palm plantation (> 3 years old plantation)

Evaluation of tropical animal-agricultural integrated production systems

Systems analysis methodology should be used for evaluating integrated production systems. Systems analysis is the study of systems, groups of interacting, interdependent parts linked together by complex exchanges of energy, matter, and information. These are key distinctions between classical science and system science. A system is characterized by strong (usually non-linear) interactions between the parts, feedbacks and the inability to simply 'add-up' small-scale behavior to arrive at large-scale results. Ecological and economic systems obviously exhibit these characteristics of systems, and are not well understood using the methods of classical, reductionist science. System analysis usually has connotations of mathematical modeling applied to these integrative problems. Mathematical modeling (especially on computers) is usually necessary to handle that complexity (Dahlan, 2002;Iyengar, 1985; Haefner, 1996). The following figures (Fig.7and 8) provide validated models for livestock integrated production systems in the country (Dahlan Ismail & Dawend Jiwan. 2015;Dahlan *et al*. 1993;Dahlan *et al*. 1995;Dahlan *et al.* 1995).

Scenario of cattle-crops integrated production systems

Scenario of sustainable cattle-crops integrated production systems shown in Fig. 9. Dahlan Ismail and Kamal Hisyam (2014) mentioned that cattle-crops integrated production systems is a sustainable integrated system that can be accepted by most of tropical countries because of availability of vast industrial crops (oil palm and rubber plantation) areas.

Oil palm plantation sector contribution to large ruminant production in Asian countries

Mega scale ruminant production in the tropics can be developed through strong support from oil palm plantation sector as their corporate social responsibility (CSR) contribution for livestock farmers due to using agriculture land for plantation instead of grazing areas (Dahlan &, Kamal Hisyam, 2014). Integrated production systems such as cattle and buffalo integrated farming (beef and dairy) can have sufficient feed materials and grazing space from the plantation areas. Buffalo can contribute draught power in handling fresh fruits bunch (FFB) in plantations (Dahlan,2013). Intensive production systems can be carried out by using palm kernel expeller (PKE) and oil palm frond (OPF) as total mixed ration (TMR) (Dahlan, 2013). Usage of PKE has to be maximized in the country. Supported by the government is needed through reducing the export quota of PKE to Europe and other countries. Investment in OPF feed mills are strongly needed in order to develop our new fibrous feed source since we have vast plantations that can provide fresh OPF daily (Dahlan, 2000). The cost of fresh OPF production is almost zero. The cost incurred only for processing and milling. OPF pellet can be exported to Korea and Japan as ruminant feeds (Dahlan, 2000).

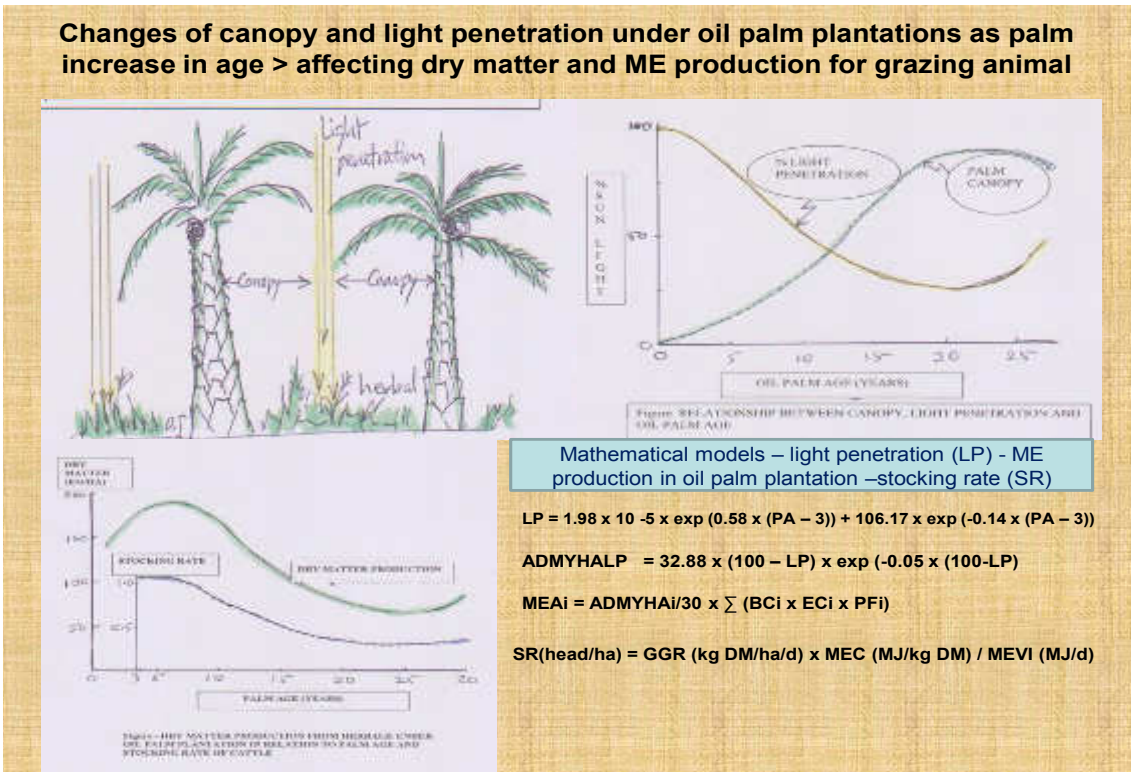


Fig. 7. Dynamic changes of light penetration and canopy development

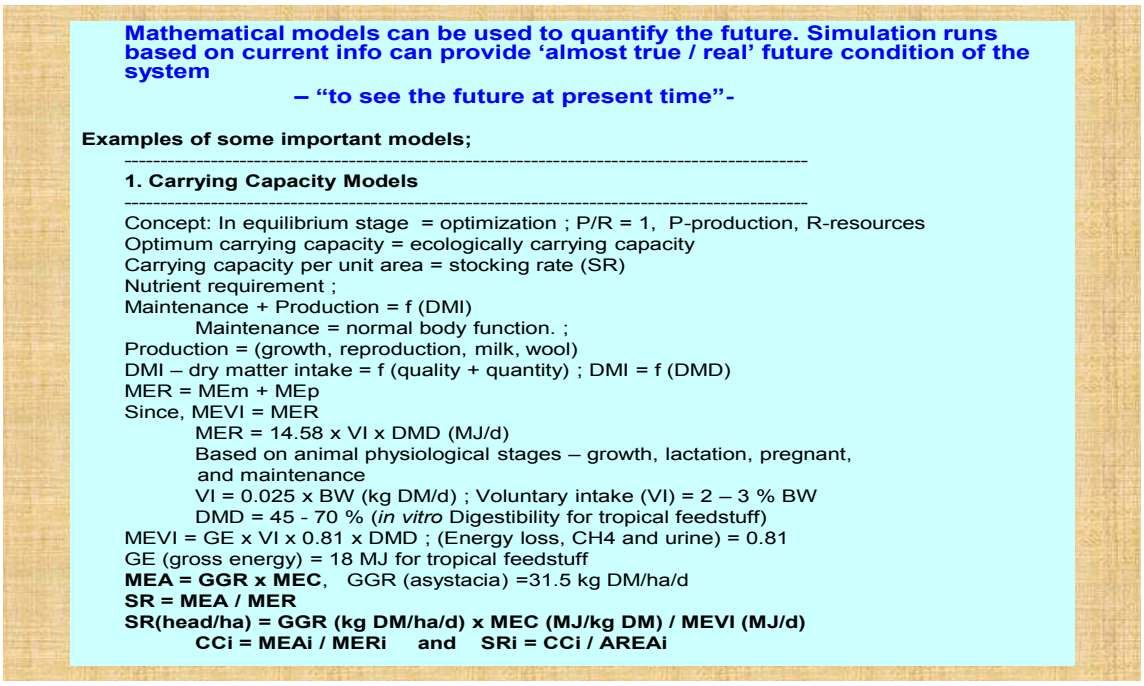


Fig. 8. LICRO Model of carrying capacity of ruminant in plantations

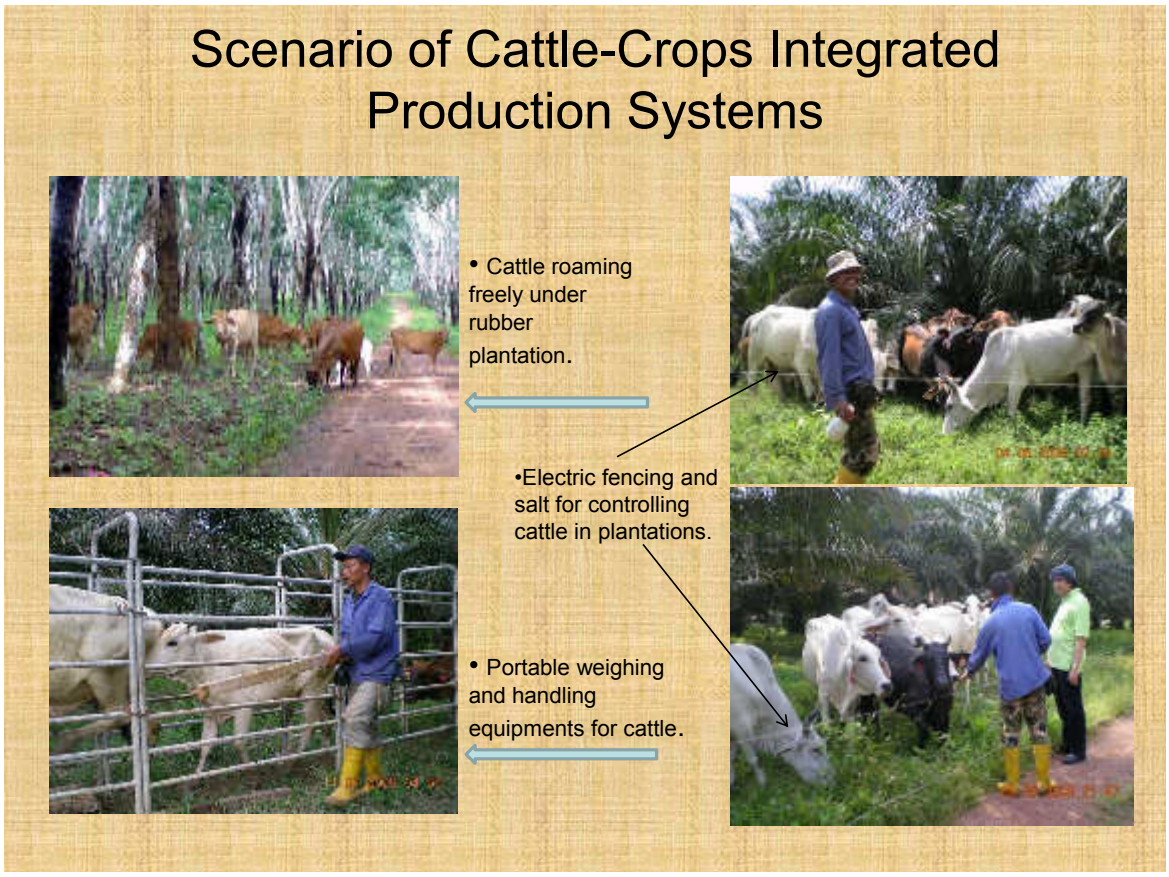


Fig.9. Cattle-Crops Integrated Production Systems in oil palm and rubber plantations

UTILIZATION OF AGRICULTURAL BY-PRODUCTS (ABP)

Production of export crops lead to huge production of ABP. Local production of feeds for the livestock is small relative to the requirement. Livestock (non-ruminant) feed requirements are met largely by importing cereal grains, particularly corn. Ruminant animals – can use agricultural by-products from export crops (palm kernel cake, palm oil mill effluent, oil palm frond and palm press fiber from oil palm, pineapple waste, cocoa pods and husk from cocoa and others) as feed resources (Dahlan *et al.* 1992). We are lucky enough to have plenty of agricultural by-products especially from the oil palm industry that can be utilized to substitute some of the imported feed ingredients for the livestock. With new technologies, improvement of the nutritive quality of agricultural by-products can be developed for livestock feeding. Most ABP are fibrous type of material. These materials are suitable for feeding ruminants (Table 1). In Malaysia the most abundance ABP are oil palm by-products (OPBP), cocoa, pineapple, coffee, and rice by-products. Other ABP or crop residues are available in small quantities and the production is seasonal.

Current issues on agro-waste or agricultural by-products (ABP)

The issues on ABP can be listed as:

a) Abundant–main bio-mass from agriculture industry, mostly from industrial crops
b) Mostly, they are fibrous materials – in wet and bulky form
c) Causing disposal problems–environmental pollution, incur cost and labour
d) Low quality feedstuff as in its original form – contains unbalanced nutrients, toxic materials, high cost of processing, limitations in feed formulation and usage
e) High cost of handling, processing and storage and
f) Incomplete information on utilisation and commercialisation

Agro-wastes / ABPs are secondary sources of ruminant feedstuff. They are in the form of extracted cake or expeller pressed materials, fibrous materials, pods or peels, part of crops other than fruit / seed (Dahlan *et al.,* 1992; Dahlan & Iskandar, 2013). Main products: oil, starch, sugar, etc – for human consumption. ABP – mostly utilised as fibrous feed source for ruminants.

Table 1. Chemical composition of some agricutural by-products

ABP[a]	DM	CP	EE	CF	NDF	ADF	Ash	Ca	P	ME
	(%)									MJ/kgDM
Oil seed cake (concentrate group)										
PKC(E)	94.0	16.2	8.2	18.0	74.3	52.9	4.3	0.2	0.6	10.2
PKC(S)	88.5	14.2	3.2	21.0	68.2	42.6	4.2	0.3	0.7	9.6
POME	89.6	12.1	24.1	15.2	63.0	51.8	18.6	0.6	0.4	9.8
Copra cake	89.8	20.9	8.0	12.0	72.2	36.3	5.2	0.2	0.6	10.2
Crop residues (fibrous group)										
PPF	94.5	4.3	21.0	36.4	84.5	69.3	9.0	0.3	0.1	4.2
OPF	34.9	7.0	2.4	32.3	78.7	53.6	5.0	0.4	0.1	6.5
Coffee pulp	90.8	10.0	2.2	29.7	36.8	27.6	8.8	0.2	0.6	8.1
Cocoa pod (D)	86.0	7.1	0.9	-	74.7	36.0	4.7	0.3	0.5	6.4
Cocoa pod (F)	18.7	7.2	1.1	31.5	-	-	16.4	0.5	0.7	7.8
Pineapple press	14.8	7.1	1.2	25.5	45.0	20.8	4.5	0.3	0.2	9.5
Rice straw	88.7	4.2	1.2	30.4	72.5	43.2	18.4	0.5	0.3	6.2
Sago pith	89.3	3.1	0.6	6.3	23.3	10.1	4.5	0.1	0.1	10.3
Plantain peels	16.3	7.6	1.5	-	47.2	28.6	5.7	0.4	0.6	12.8

[a]PKC (S) – Solvent extracted palm kernel cake; PKC (E) – Expeller press palm kernel cake; PPF – palm press fibre; POME – palm oil mill effluent; OPF – oil palm fronds; Cocoa pod (D) – dried cocoa pod; Cocoa pod (F) – fresh cocoa pod.

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Most abundant ABP in Malaysia: Oil palm by-products (OPBP) as livestock feedstuff

Oil palm has numerous by-products that can be used as animal feed. Most of oil palm by-products (OPBP) are used in its fresh form or after processing it as ruminant feed. Two important OPBP are palm kernel cake or expeller (PKC/PKE) and oil palm frond (OPF). Both OPBP can be used in almost all livestock species. By maximizing the utilization of OPBP as livestock feed, Malaysia can feed up to 4.8 million heads of cattle. Ruminants can utilize OPBP up to 90% as dry matter basis in the diets. Quality of livestock products can be improved through proper feeding and formulation of OPBP in the diets. The utilization of OPBP as livestock feed will thus present significant contributions to the development of livestock industry in Malaysia and tropical countries.

Quality of livestock products fed on OPBP

OPBP has been used in many dietary composition of livestock raised in intensive system and has also been used as supplementary feedstuff in almost all types of livestock species. The major contribution of OPBP is as feed ingredients for the ruminant animals. Higher percentage of OPBP in the diets formulation of ruminant has been evaluated in many research institutions and universities (Dahlan *et al.* 1992;Dahlan *et al*. 1988). Experimentation by using OPBP as a diet in feedlot feeding showed that the quality of local beef could be improved through planned feeding systems by using the right combinations of OPBP in the diet of the animals.

Oil palm fronds (OPF) as fibrous feed for ruminants

OPF is the leaf like part of oil palm tree which is produced continuously from the oil palm (*Elaeis guineensis* jacq.) plant. They are readily available by-product of oil palm plantations, that are cut down during harvesting of fresh fruit bunches, pruning of senescence fronds, and felled palm during re-plantation.

Economic life span of oil palm: 25 - 30 years - during replanting a huge amount of OPF also generates. To get the FFB from the oil palm plant usually 2-3 OPFs were cut. Based on 2-3 OPF/FFB and 144 plant/ha, the OPF production is about 3974 fronds/ha/year and thus the total DM production of OPF is near 5484.6 kg/ha/year. Estimated figure of OPF (dry matter) production based on 2.6 million ha of matured oil palm plantations is about 27 million ton/year (Fig. 10).

Chemical composition, nutrient intake and digestibility of fresh, ensiled and pelleted OPF have been evaluated for ruminant feedings by Dahlan (1992) and Dahlan *et al*. (2000). They stated that OPF is a new non-conventional fibrous feed for ruminants. The nutrient content of OPF can be summarized as; the average crude protein (CP) is about 7 %. OPF contains a considerable amount of lignin and silica - that reduce its nutritive value when fed to ruminants. The average CP composition (11.0%) in the leaflets suggests its potential value for livestock feeding as it's CP contents is far above the critical 6.25% CP level required to maintain normal intake by ruminants. OPF leaflets had a higher ($p<0.05$) CP value and crude fat content than petiole (stem of frond). Cellulose levels are usually lower than hemi cellulose in both petioles and leaflets. The fibrous (CF and NDF) content and long fibre type of OPF is suitable for higher butter fat content in milk of dairy animals.

The collection, processing, preservation and utilization of oil palm frond (OPF) have the potential to be exploited for ruminant production in intensive and extensive systems. OPF can be utilized in fresh, silage or processed (pellet) form for ruminants (Dahlan, 2000). OPF silage has been used for dairy goat and beef production. The quality of the milk and beef were comparable with other recorded results elsewhere.

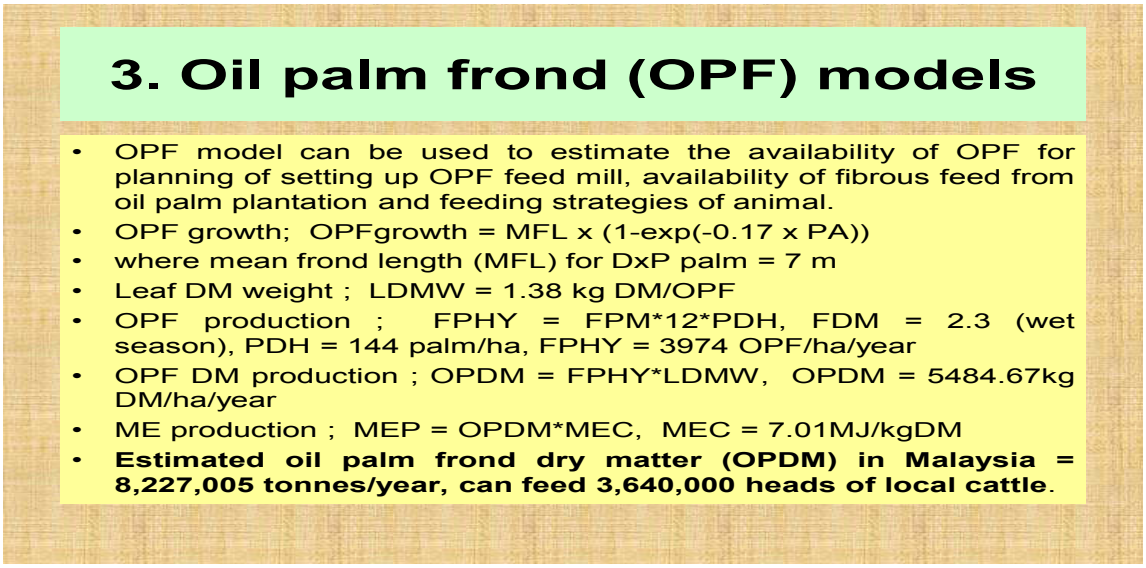

Fig. 10. Oil palm frond (OPF) models

Potential ABP based total mixed ration (TMR) formulations

PKC and OPF can be considered as important ingredients in most of TMR formulations. PKC is readily available and contain sufficient nutrient especially crude protein to meet the nutrient requirement of cattle, goat, sheep and buffaloes. OPF is the source of green fiber feed for herbivores including poultry. Cost of ABP based TMR were affordable and feeding management for ruminant in

the feedlot is practical. The technology is suitable for smallholders and large scale commercial ruminant production.

Five type of formulated diet from ABP were fed to cattle in feedlot (Dahlan *et al.* 1992). The ABP used are palm kernel cake (PKC), palm press fiber (PPF), palm oil mill effluent (POME), cocoa pod (COP), coffee pulp (COF), and pineapple waste (PAP). PPF can be replaced by OPF in all TMR. Studies on the effect of feeding OPBP in intensive feed lotting using Kedah-Kelantan cattle and crossbred beef cattle showed that a diet consisting of 52% PKC, 15% PPF and 30% POME was one of the best formulated diets for the feedlot operation in order to produce prime carcass characteristics from local and crossbreds. The carcass produced had the highest % carcass meat and the lowest % of carcass fat. The diet also enhanced the quality of the beef through the formation of marbling, increase juiciness and tenderness in the meat of local and crossbred cattle. The meat of swamp buffaloes fed on OPBP diet showed more tender and lower cooking loss than meat from pasture-fed animal (Dahlan *et al.*1988). The study showed that all ABP formulated diets produced high quality carcasses which are better than grazing animal and lower cost of production.

FOOD WASTE AS ENERGY SOURCE FOR POULTRY PRODUCTION

The most important trait in poultry production is the efficient utilization of nutrients from feedstuff as the feed cost is one of the major components of total cost of production. According to Hinrich and Steinfield (2007), feed alone contribute about 60 – 70 % of the total cost of poultry production. There is a need to formulate rations that will fulfill all the nutrient requirements including energy and protein for growth. Most of organic food waste and agricultural by-products can be converted into poultry feeds. These unconventional feed materials can reduce feeding cost and at same time recycle the waste materials and reduce pollution problem. Nearly 1.5 billion tons of spoiled and uneaten food around the world throws out each year (Park, 2012). By proper processing technology these waste materials can be utilized efficiently. The use of agricultural by-products, wet food waste, insect meal, unfertilized egg and other organic materials can be considered as an alternative source of protein-energy rich poultry feed. However, the time-consuming nature of the work, low feed efficiency, nutrient imbalance, poor environmental hygiene and the difficulty of disease prevention, made feeding wet food waste to poultry unpopular (Cho *et al.* 2004). The result of processed wet food wastes into dehydrated food waste product show some advantages in growth performance, carcass traits and nutrient digestibility in native chicken (Chen *et al.* 2007; Hossein & Dahlan, 2015).

Processing food waste, insect larvae and unfertilized egg for poultry feed ingredients

Experiment using food waste as energy source for poultry was conducted by Nadia *et al.,* (2014) and as replacement for grains by Hossein & Dahlan (2015). The food wastes were collected from restaurant in Universiti Putra Malaysia Campus. Inorganic wastes were removed using artificial selection. "Clean" food waste was soaked in hot water at >90°C to<100°C for 10 minutes. Waste water with oil was removed via filter bed. The waste was dried and grinded into mashed form. The composition of DFW (50% of the ingredient of dry matter basis) was developed into suitable poultry diets as a source of energy and replacing grains. The diets were analyzed for their proximate composition according to AOAC (1988).Common super worm (*Zophobasmorio*) and unfertilized egg was used as a protein supplement in this study. Super worms larvae stage 2 (Dried meal worm - DMW) and unfertilized egg were processed, dried, grinded and used as additional protein sources for poultry feed. DFW, DMW and UFE are suitable for free range poultry production and will reduce feeding cost of village chicken operation (Table 2).

Table 2. Nutritional value of food waste, insect larvae and unfertilized egg as feed ingredients for poultry

NUTRIENT	Dehydrated Food Waste	Dried Meal Worm (larvae)	Unfertilized Egg
Moisture (%)	9,03±0,21	12,19±0,26	12,56±0,27
Crude Protein (%)	22,91±0,45	40,87±0,03	40,51±0,16
Crude Fat (%)	18,54±0,22	31,96± 0,92	2,52±0,27
Crude Fiber (%)	4,86±0,18	8,34±0,07	0,15±0,07
Ash (%)	5,47±0,14	5,04±0,06	22,93±0,64
G. Energy (kcal/kg)	4.500,54±1,04	5.709,0±0,98	5.744,9±1,20

The results from the proximate analysis showed DMW and unfertilized egg have high protein level compared to DFW. This is because super worms and unfertilized eggs are pure animal protein. They are also complete protein as they can supply all the essential amino acids including the most lacking amino acids in plant sources such as tryptophan, methionine, isoleucine and lysine (Mader, 2008). The protein content in the DFW is higher than as reported by Chen et al. (2007) which is 15,79% and within the range as reported by Rosmadi (2012) which is ranging from 18-24%. This is because the variation of the substances in the fresh food waste that had been used. The fat content in the DFW is 18.54%. This value is followed the agreement with others reports that contain much higher fat content as reported by Rosmadi (2012), DFW has crude fat ranging 19-21%. The crude fat content in DFW can be reduced to 7,16% if soaking in hot water for 10 minutes (Hossein & Dahlan, 2015). Fiber is a plant based material. The amount of crude fiber content in the super worm is 8,34%, but this value is not in agreement with the other reports that contain much lower fiber content as reported by Finke (2002), which is about 2,12% on DM basis. The crude fiber found in super worms is mostly come from their feed (such as oats, wheat, and rice bran). The chemical compositions of all these organic materials are very suitable for poultry feeding (Table 3). DFW can be used up to 60% of ingredient on dry matter basis in grower and finisher diet formulations of poultry (Hossein & Dahlan, 2015).

Use of DFW, DMW and UFE for energy and protein sources in poultry diets

An experiment was design to have high and low dietary energy to protein ratios using these ingredients. In this study, differences were observed between different levels of dietary energy to protein ratio on growth performance of chicks were predictable. Differences in performance variables are expected since it is known that alteration in dietary energy to protein ratio will result in differences in animal performance. It is important to maintain the energy to protein ratio as both of the nutrients play a prominent role in the performance of broiler chicken (National Research Council (NRC). 1994;Aftab *et al.* 2006). By using DFW, DMW and UFE, an ideal range of calorie: protein ratio is 132:1 to 155:1 for broiler chicken was suggested which could be lowered to between 155 and 195 or 10% of the recommended levels when broilers are fed low crude protein concentration (Aftab *et al.* 2006). The results of the present study showed that during the one to six weeks growing period, a single dietary energy to protein ratio of 134kcal/kg protein optimized both feed intake and growth rate of the chickens. Results of the present study generally agree with several investigators that increased dietary protein content with the ideal range of calorie: protein ratio resulted in improved growth performance and can cut cost of production (Temim *et al.* 2000;Nguyen & Bunchasak, 2005). Energy and protein are two most important nutrients for well growth and developments of animal. These two nutrients are greatly important at young age as the growth rate is at optimum. Nguyen and Bunchasak (2005) stated that the growth performance of the Betong chick was significantly reduced when 17% CP was provided at a very early stage of growth (0-21 days).The other study done by Jackson *et al*., (1982)on broiler chicks was found that a low protein diet below 18% CP reduced

growth rate. The findings of present study therefore indicate that 134 ME:CP ratio could meet the growth requirement of the village chicken since subsequent levels did not significantly improve the growth performance. DFW can be used as energy source in poultry feed formulation and can replace imported grains by 100% (Hossein & Dahlan 2015).By using ICIC ways we are not only reduce cost of poultry production through replacing corn and soybean as poultry feed ingredients, but also solve organic waste disposal problems.

Table 3. Chemical composition of dehydrated processed food waste (DPFW) after soaking in hot water for 10 minutes

Items	Mean±S.D.
Dry matter (%)	89,3±1,3
Crude protein (%)	16,0±1,2
Crude fat (%)	7,1±1,0
Crude fiber (%)	3,7±2,1
Crude ash (%)	7,4±1,1
NaCl (%)	3,07±0,4
Ca (%)	1,56±0,5
Phosporus (%)	0,87±0,05
GE* (kcal/kg)	4.053,54±1,0

SUSTAINABLE ANIMAL-AGRICULTURE AND ENSURING FOOD SECURITY

Solving food security problems should be based on total integrated production concept and through ICIC ways. Thus, the following approach should be applied in animal-agricultural production system.

1. Combine all resources (integrated manner) from various industries to maximize production.
2. Develop "Mega" size projects to cater all aspects of animal-agricultural industries, with high capital investment and competitive business ventures.
3. Must have complete (A – Z) cycle of production system from farm to marketing outlets.
4. Activate linkages and supply chain with other related industries- make use of win-win or synergistic cooperation.
5. Adopting marketing mix concept – considering the 4Ps – products, price, place and promotion.
6. Ensure success of short, medium and long term production by continuously monitoring changes occurring in the dynamic systems – through considering the 3Ps (People, Planet and Profit) as in sustainable development approaches in business industry development.
7. Include other co-activities in order to have multiple outputs – tourism and services.
8. Upgrade the status of animal-agricultural sector into Primary Industry status (priority # 1) for national food security function (vital) and go for high quality products.
9. Considering organic farming and green technology in all project development for future sustainability of agricultural industry.

Future works needed

1. Development of Standard Operating Procedure (SOP) and Farming Policy for Ruminant-Crops Integrated Production System for sustainability of ruminant production in the tropics.
2. Development of Agricultural By-Products Reference Center and Utilization Systems for livestock-crops (LICRO) integrated production systems.
3. Development of bio-waste management policy through recycling and conversion of organic waste into animal feed industry.

4. Development of high quality and healthy livestock and safe livestock products from integrated production systems for National Food Security.

CONCLUSION

We strongly believe that integrated livestock-crops plantation production systems will be a sustainable type of agricultural production system in the tropics; At least in Southeast Asia Region (Malaysia, Indonesia, Thailand, Philippines, Cambodia and others). Resource evaluation and strategic planning for sustainable agriculture is strongly needed for tropical countries in order to become "Developed Nations", without neglecting organic waste issues especially agricultural by-products and food waste disposal problems. Appropriate technological innovation is needed for re-cycle and re-use these materials in order to develop efficient, clean and profitable business.

By considering these resources and opportunities; huge land bank, skilled human resources, ample natural resources, strategic location and tropical environment and together with these development approaches; green business and adapting green technology (3Ps-people, planet, profit) and application of marketing mix concept (4Ps – products, price, place, promotion) the countries *target* can be achieved in near future.

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Improving Beef Cattle Production in Free Range Systems: Implications for Indonesia

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This review describes the relevant herd management practices and policies of northern Australian owners/managers of beef breeding businesses, focusing on those considered to be potentially applicable for free range beef cattle operations in Indonesia.

INTRODUCTION

The Northern Australian beef industry encompasses beef production within northern Western Australia, the Northern Territory and Queensland, and represents approximately 60% of the national beef herd and 9000 beef producing properties (Martin *et al.* 2013).The South East Asian live export trade is an important market for the northern Australian beef industry (Bortolussi *et al.* 2005) with the northern parts of the Northern Territory, Western Australia, and Queensland (Martin *et al.* 2013) supplying approximately 75-80% of the market (Riley *et al.* 2002).

The profitability of north Australian beef cattle enterprises has recently been reported as declining in terms of trade over time (McLean *et al.* 2013) due to lack of productivity gains, diminishing returns from reduced turnoff, lower beef prices and increased farm debt (Gleeson *et al.* 2012). Low reproductive performance in northern Australia is a result of multiple factors including pastures of poor quality and quantity during the dry season, extreme temperatures and humidity during dominant calving and mating periods, and large variability in seasonal rainfall (Entwistle 1983).

The northern rangelands vary greatly in terms of pasture production, fertility and soil types and therefore their ability to support animal production (Tothill and Gillies 1992) and are largely based on unimproved native or naturalized pasture species (Coates *et al.* 1997). Summer temperatures are high throughout northern Australia, ranging between 25-40^{o}C with heat waves commonly experienced with maximum temperatures up to 50^{o}C.Rainfall in the tropical parts of northern Australia is highly seasonal, with 90% of the annual rainfall falling between November and April during the 'wet' or 'monsoon season' (Nicholls *et al.* 1982).

In northern Australia, approximately 85% of beef cattle have some *Bosindicus* content to enable them to better cope with high environmental temperatures, low quality pastures and internal and external parasitism; in particular cattle tick (*Boophilusmicroplus*) and buffalo fly (*Haematobiairritansexigua*) infestation. Cattle are typically mustered (brought together from the paddock into a cattle handling facility) twice a year for branding, weaning and other husbandry such as pregnancy diagnosis, usually in the late wet-early dry season (April-June) and then again in the mid-dry season. Helicopter mustering is now commonly used on most extensively managed properties. Approximately two-thirds of cow herds in the dry tropical rangelands of northern Australia are continuously mated, whereas in areas with higher soil fertility and more intensive management, herds are control mated typically for periods of 3 to 7 months.

ACHIEVABLE RATES OF PERFORMANCE

To evaluate the reproductive performance of a beef cattle herd requires consistent and accurate collection of appropriate data with standardized approaches of analysis. It is paramount

that the limitations of each measure are understood to minimize incorrect comparative analyses between herds and potential misinterpretation of results.

The interval from calving to the establishment of their next pregnancy is a significant determinant of the productivity and profitability due to its influence on both the annual percentage of calves weaned and the live weight of calves at weaning. The measure inter-calving interval, particularly within Indonesia, is often used to describe the efficiency with which herds or cows achieve this. However, there are known significant limitations with its derivation as it typically over-represents actual performance. For the derivation of inter-calving interval two calvings are required. Therefore, those cows that do not re-conceive or that are culled before re-conceiving are not represented in the measure, resulting in an optimistic representation of actual performance (Morton 2010). This is particularly true for first-lactation cows in northern Australia as generally only a small proportion re-conceive in less than 9 months from calving. A further major shortcoming of this measure in monitoring overall herd reproductive performance is that heifers are represented in this measure. The proportion of cows achieving pregnancy by various time periods since calving or mating start date, such as 4 months, has been used to describe reproductive performance and is a more robust measure of herd reproductive performance. Other measures commonly used within northern Australia beef enterprises are annual pregnancy rate, foetal/calf loss and weaning rate.

In assessing the performance of different beef production systems it is important to understand what the commercially achievable levels of performance are, as maximizing reproduction does not necessarily maximize profitability. Improved economic status of enterprises can only be realized if the expense of altering management to improve the reproductive performance of herds is less than the economic return from altering management. When desired levels of performance are higher than those routinely achievable on the available resources and conditions, the economic framework is typically not feasible as the expense of generating the required management changes are usually greater than the economic return. A recent study reported achievable and typical levels of reproductive performance for commercial beef herds within tropical tall grass pastured areas of northern Australia (Table **1**)(McGowan *et al.* 2014).

Table 1.Typical and achievable levels of performance for beef herds of tropical areas of northern Australia (Northern forest)

Cow age group	Pregnancy rate (%)	Pregnancy within 4 months* (%)	Foetal/Calf loss (%)	Weaning rate (%)
Heifers				
- *Typical*	67		16	55
- *Achievable*	81		11	69
1st lactation cows				
- *Typical*	43	11	10	23
- *Achievable*	72	18	5	63
Mature cows				
- *Typical*	66	17	14	54
- *Achievable*	74	31	9	61

*only derived for those cows that successfully reared their pregnancy.

MANAGEMENT OF THE BREEDER HERD

The major aspects of managing breeder cattle in free range systems of northern Australia and Indonesia, include management of the pasture resource, weaning management, addressing any mineral deficiencies and using an appropriate genotype(Holroyd and Fordyce 2001).

In tropical regions of northern Australia, and Indonesia, it is important that cattle are of an appropriate genotype. That is, a balance between productive ability, particular market aspects

(growth, size, type) and environmental tolerance. However, tropically unadapted cattle that cannot effectively dissipate heat suffer from heat stress which has negative effects on fertility and milk yield, potentially compromising calf survival. In tropical and subtropical regions, adapted genotypes are generally used as they exhibit higher survival and growth rates (Rudder *et al.* 1985).In areas of Queensland, substantial productivity gains by improvement of growth rates where documented by crossbreeding of Brahman bulls with *Bostaurus* cows (Rudder *et al.* 1976). However, the reproductive capacity of tropically adapted genotypes appears to decline with increasingBrahman content.

A recently completed study conducted within Indonesia reported comparable rates of pregnancy within 100 days of calving for Brahman/Brahman cross (12.4%) to Ongole (14.6%) cows (Mayberry *et al.* 2015). This project also found that Bali (*Bosjavanicus*) cattle outperformed *Bosindicus* cattle for reproductive performance, which on average 49.2% of cows achieving pregnancy within 100 days of calving.

Frame size of cattle has also been shown to influence reproductive performance (McGowan *et al.* 2014). Generally, larger framed cattle reach puberty later and contribute fewer calves over their lifetime due to their increased maintenance energy requirement. Thus, an adjustment of stocking rates is required to reflect the size of the animals and consequently, fewer animals graze the available area reducing the potential number of weaners contributed by the herd on an annual basis.

Sustaining the pasture resource by using a suitable stocking rate is vital to ensure the long term viability of free-range beef production systems. Over utilizing pasture resources can lead to a spiral decline in the condition of the land and pasture over time. Land declining in condition generally cannot yield as much pasture as land in good condition meaning that less pasture is available to support animal production, decreasing the amount of kilograms of beef produced per unit area by both live weight gains and reproductive performance. Consequently this may lead to an increase in inputs (supplementary feeds) required to maintain animal performance or reduce the risk of mortality of cattle.

The incorporation of culling is essential in maintaining a profitable and productive breeding herd. As increased mortality is associated with aged cows, mortality risk can be managed by culled those cows greater than approximately 10 years of age or when their ability to forage declines due to deteriorating dentition Additionally, removing those females with low fertility is a favourable long-term strategy as fertility traits are heritable and should always be based on performance records.

MANAGEMENT OF BODY CONDITION

A key requirement of efficient reproductive performance is the ability of cattle to cycle in early lactation with a number of detailed studies identifying nutritional influences, from before calving, being a significant determinant of early-lactation conception(Scaramuzzi *et al.* 2011). Body condition score reflects the nutritional status of cattle and indicates the body protein and fat reserves that can be mobilized during periods of under-nutrition and lactation when energy requirements are higher.

Body condition score is a key parameter that affects reproductive efficiency of all breeds. Simply, heavier/better conditioned heifers and cows have higher pregnancy rates. Mayberry *et al.* (2015) reported an across breed improvement of 21% for pregnancy within 100 days from calving and a decrease in calf loss by 14.6% for body condition score at calving≥4.0 cows relative to those ≤2.0in a study completed in Indonesia. Each one unit change in body condition was estimated to be equivalent to a change in live weight of 9.6 kg, 58.5kg and 31.3kg for Bali, Brahman and Ongole breeds respectively (McCosker unpublished data).

Primarily, body condition of cattle can be manipulated by two ways: either by improving the quality of their diet such as supplementary feeding, reducing stocking rate, improved quality of pasture, or by reducing the duration of lactation by weaning management. Additionally, there are a number of different classes of cattle with different nutritional requirements such as heifers, non-

lactating and lactating cows, and aged cows. Whilst, segregation is not always a viable option, having management groups of free-ranging cattle based on their nutritional requirement may enable more appropriate management of those cattle with high nutritional requirements(eg. lactating females) and reduce the risk of mortality or increase the probability of pregnancy.

WEANING AND WEANER MANAGEMENT

Lactation has a large energy requirement and extended lactation when nutrition is inadequate can lead to large losses in body condition and even mortality. Managing the duration a cow lactatesis a critical breeder herd management strategy to support breeding performance. The key objective of weaning is to conserve body condition by minimizing loss across periods of low pasture quality, allowing an increased number of cows to be in better condition at the time of mating and consequently, improving the likelihood of lactating cows achieving pregnancy. The optimum timing of weaning is the best compromise between weaner growth and loss of body condition of cows.

There are minimal differences between the growth rates of weaned versus unweaned progeny if they're appropriated supplemented following weaning;particularly during dry season conditions as growth of unweaned progeny is restricted from diminished milk yield and quality during periods of diminished pasture quality. Furthermore, weaning results in a net reduction in maintenance requirements as the additional expenditure of energy and protein associated with lactation is less than that required to maintain a weaned calf. Additionally, by redirecting nutrients away from lactation to growth allows cows to improve body condition by the time of the next calving, increasing the likelihood of conception whilst lactating. Furthermore, lactation in itself reduces cycling in cattle as, particularly in *Bosindicus* cattle, the stimulation of suckling suppresses the release of hormones involved in ovulation.

First-lactation cows are generally still growing whilst lactating for their first time. The partitioning of nutrients towards growth as well as lactation often results in first-lactation cows being in poor body condition, which is considered responsible for prolonged periods of post-partum anoestrous often reported for first-lactation cows. Under research conditions in central and northern Queensland, Johnston *et al.* (2013) reported average lactation anoestrous intervals for tropical composite and Brahman first-lactation cows as approximately 84 and 134 days, respectively. Thus, progeny of first-lactation cows are generally weaned earlier than those from mature cows to reduce loss of body condition and increase their likelihood of pregnancy.

MATING MANAGEMENT

In contrast to much of Indonesia, beef production systems of northern Australia rely on very little use of artificial insemination. Bulls are generally exposed to cows for a minimum of 5-7 months and in many cases continuously. In a recently completed study conducted in Indonesia, Mayberry *et al.* (2015) reported a 22.3% higher pregnancy rate within 100 days of calving for those cows naturally mated, when compared to those mated via artificial insemination. The reduced pregnancy rate in those cows mated by AI was partly explained by problems associated with detection of oestrous, ability to contact AI technician or availability of AI technician. Additionally, the reduced likelihood of pregnancy via AI compared to natural mating is also well established.

The timing of mating is a criterial component of beef production systems with its objective to match the nutritional requirements of the breeding herd to the seasonal pattern of the pasture supply and quality. In monsoonal climates, controlled or seasonal mating aims to prevent cows calving at unfavourable times of the year rather than restrict the calving period. As such, the nutritional demands of breeders are greatest while lactating, peaking shortly after calving. Therefore the time of calving should match or be just before the peak nutritional quality of the pasture. Like northern Australia, Indonesia has extreme variations in rainfall, with the majority of the annual rainfall occurring during November-March suggesting that October to December is likely to be the

optimum period for calving. However, interestingly Mayberry *et al.* (2015) reported that cows calving during June to September had a greater likelihood of pregnancy within 100 days of calving compared to other times of the year.

Although maximum reproductive performance does not always equate to maximum profitability. If there are market incentives, such as increased valuations of cattle due to festive periods or religious ceremonies, these may dictate preferable times of mating. In such instances appropriate consideration of risk of mortality, loss of body condition and reduced future performance of cows is required as increased profits derived from the sale of the progeny can only be realized if it is not at the cost of future breeder performance or survivability.

In situations where the removal of bulls is not practical, herds are often continually mated all year round. Under such situations, conceptions are generally related to the rainfall in the preceding two months (Holroyd *et al.* 1979). Therefore, in monsoonal environments approximately 2/3 of conceptions naturally occur within the optimum period. Under such mating systems two annual musters are required to reduce body condition loss, mortality and increase the likelihood of cows becoming pregnant during the wet season (Sullivan and O'Rourke 1997).

MANAGEMENT OF HEIFERS

It is well established that the age of puberty and hence, age at which cattle contribute their first calf influences the profitability of a beef herd. However, a number of research studies conducted in northern Australia demonstrate that most heifers do not attain sufficient weight to be fertile until approximately two years of age. Therefore, the majority of properties within northern Australia calve heifers for the first time at three years of age. Heifers need to have reached their critical mating weight to achieve good pregnancy rates and increased likelihood of conceptions when lactating for the first time. The critical mating weight of Brahman cattle is thought to be approximately 340kg. However, there is large variation within and between breeds.

The fertility of beef cows is generally lowest during their first lactation due to the large nutritional requirements of lactation and maternal growth at the same time (Entwistle 1983). It is for this reason that the initial timing of mating of heifers is critical, with peak lactation planned to coincide with the best nutritional conditions. Segregation of heifers to provide preferential nutritional management is also a cost-effective way of improving fertility and increasing the likelihood of conceptions while lactating. Early weaning of their calves will also help to reduce loss of condition. Mating heifers one month earlier than cows provides increased opportunity to conceive during lactation, while timing of mating should also aim to avoid heifers calving in the mid-late wet season to reduce the risk of dystocia.

Heifers that achieve pregnancy early after being mated for the first time and first-lactation cows that achieve pregnancy are valuable breeding females as these traits are linked to increased lifetime reproductive performance. Male calves should be preferentially kept as potential sires from cows that demonstrate these traits.

NUTRITIONAL MANAGEMENT

Feeding supplementary feeds to breeding cattle to achieve target body conditions or mating weights is an additional cost. In free-range management systems, feeding costs can be reduced by appropriately stocking the pasture resource, segregating cattle into management groups on the basis of their nutritional requirements and matching lactation to the peak nutritional value of the pasture by managing the timing of mating and weaning.

These management factors are the most important things to get right in nutritional management. However, if mineral imbalances exist they also need to be addressed to ensure sound reproductive performance. Cattle grazing native pastures throughout much of northern Australia are generally limited by protein during the dry season and phosphorus during the wet season. Data from

Bali collected during the dry season suggests that the dietary crude protein content of pastures within low lying areas (eg. 5-6%) (Nitis 2006)is probably unable to meet the nitrogen requirements of breeding cattle. However, when cattle have diets that incorporate tree and shrub legumes or have access to grazing areas that are still actively growing during the dry season (eg. hilled areas), these diets will potentially satisfy a breeding cow's nitrogen requirement.

Cattle grazing P deficient situations can develop signs of aphosphorosis such as reduced appetite, growth rate, reproductive performance, milk yield, bone abnormalities, and stiffened gait (also known as 'peg leg') (Winks 1990). Calcium (Ca) and P are closely linked in animal metabolism with similar symptoms for both Ca and P deficiency. Pregnancy and lactation produce high demands for calcium and phosphorus which can lead to deficiency if the diet is inadequate in these nutrients. Calcium deficiency during lactation causes milk fever. Breeding cattle continuously grazing P deficient pastures have generally shown poorer than expected reproductive performance although, responses in reproductive performance from the supplementation of P have been inconsistent (Underwood and Suttle 1999) which has mostly arisen due to the animal's ability to mobilize skeletal reserves when dietary P is inadequate. An indicator of wet season phosphorus availability was recently identified as an important factor affecting both pregnancy while lactating within 4months from calving and foetal/calf loss (McGowan *et al.* 2014); having both a direct effect as well as moderating the effects of other risk factors, such as body condition, on reproductive performance. The provision of supplemental P to aged cows has also been associated with reducing breeder mortality (Henderson *et al.* 2013).

During the wet season, the protein and energy content of the pasture increases promoting animal production and growth, which in some situations can lead to phosphorus (P) being the nutrient limiting production. Prabowo (2012) identified P as a limiting nutrient with areas of Indonesia and reported a response in wet season body weight of buffaloes supplemented with P. There are many reports of P supplementation increasing growth rates of growing cattle in northern Australia.

IMPLICATIONS FOR INDONESIA

Even though a number of dissimilarities exist between Australian to Indonesian beef production systems it is apparent that there are number of over-arching principles applied to beef production systems, in northern Australia that are potentially applicable for free range beef cattle operations in Indonesia. However, one disguising difference when comparing Indonesian free-range production systems to those in Australia is level of intensification. Reasonable levels of reproductive performance are achieved in northern Australia with relatively little inputs due to very low stocking densities allowing cattle to heavily selectively graze their available pasture resources. It is the opinion of the author that it is unrealistic to expect such low stocking densities to be achieved in free-range systems in Indonesia. Therefore, the incorporation of some inputs such as tree legumes and crop residues to provide additional energy and crude protein, particularly during the dry season, will be required to maintain appropriate levels of reproductive performance and potentially reduce the risk of breeder mortality. Under this nutritional plane, a moderate framed tropically adapted cow, in contrast with bigger later maturing genotypes (such as Limousin and Charolais), will have lower maintenance requirements and increased likelihood of reconceiving during lactation and contribute more calves during her lifetime. Deliberately avoiding cows lactating during the most unfavourable times of the year by not exposing cows to bulls during Oct-Dec and weaning progeny between 3-6 months of age, depending on the condition of the cow, will maximize the likelihood of cows being of suitable body condition (≥3.0) at the time of calving and increasing her likelihood of re-conceiving whilst lactating. Managing cows to readily achieve pregnancy whilst lactating will ultimately result in increased productivity of free-range and smallholder operations, increased number of breeding cows and increased domestic supply of beef in Indonesia.

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Strategies to Improve Goat Production in India

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ABSTRACT

Goat husbandry in India is essentially an endeavor of millions of small holders who rear animals on "Crop Residues" and "Common Property Resources". India has rich repository of goat genetic resources with 24 recognized breeds and a large proportion of non-descript or mixed breeds. The poor man's cow- goat has tremendous potential to be projected as the 'Future Animal' for rural prosperity under the changing agro-geo-climatic conditions and depleting resources in India. There is great scope for rearing goats for meat production under semi-intensive and intensive systems of management. With shrinking resources and increasing demand of goat meat and milk, there is an urgent need to genetically improve and manage these animals through modern scientific tools to enhance their productivity. The future of goat breeds in India lies in the appropriate approaches to conservation, combining a number of integrally related components and effective action programs approached holistically for successful conservation of goat genetic resources. The proper breeding strategy needs to be adopted after anticipating and identifying those forces that drive goat production system for high productivity in India.

Key Words: Goat Breeds, Genetics Improvement, Strategies

INTRODUCTION

Goat is one of the important animals serving the mankind in several ways by producing milk, meat, fiber and valuable by-products such as skin, offal and manure. They substantially contribute to the rural economy and provide livelihood to the poor masses in tropical countries and supplement their food with nutritious milk and meat. Among all species of farm animals, goats have the widest ecological range since their domestication during Neolithic Revolution about 10 millennia ago. Goats are hardy, disease resistant and can thrive and reproduce well in tropical, cold, humid as well as dry regions and are an efficient converter of the sparse vegetation. Unlike agriculture, goat husbandry has a distinct advantage as it provides a stable, year-round income – an important economic incentive for the small farmer to take to goat farming as a profession.

India is recognized as one of the 12-mega biodiversity centers of the world. Goat husbandry in India is essentially an endeavour of millions of small holders who rear animals on "Crop Residues" and "Common Property Resources". India has rich repository of goat genetic resources with 24 recognized breeds and a large proportion of non-descript or mixed breeds. They are distributed in extremes of climates i.e., from tropical desert, characterized by temperature extremes (i.e., Thar desert) with insignificant rainfall and sparse vegetation to high altitude mountain areas up to 2,500 m.s.l such as the Himalayan region. Goat breeds habituated in different agro climatic zones of India have evolved themselves more through genetic isolation and natural selection than through deliberate intervention by man.

Goat meat (*chevon*) is one of most preferred meat type by the consumers in several parts of India and carries premium value in the market. The vast population and large genetic resource are the strengths of goat husbandry activities in India. There has been a consistent growth in goat numbers and productivity over the past few decades. Improved goat production could significantly

enhance the economy and living standards of millions of goat farmers in India living in eco-fragile and vulnerable zones of the country. Resilience of goat production to harsher environmental conditions offers amicable solutions to alleviate the vulnerability of the small and marginal farmers at the time when crop production fails due to adverse climatic conditions and where the natural resources are limited. The poor man's cow- goat has tremendous potential to be projected as the 'Future Animal' for rural prosperity under the changing agro-geo-climatic conditions and depleting resources in India.

POPULATION AND PRODUCTION STATISTICS

The goat population of India as of 2012-13 is about 135 million goats, which is about 14.5% of the world goat population. Considerable growth has been recorded in production of goat meat and milk during the last decade. The goat meat production has doubled (9.3% to 18.3%) and goat milk production has shown a growth rate of 31.53% during the last decade. The country stands first in goat milk production and is the second largest meat producer in the world sharing 26.3% goat milk and 10.4% goat meat production. Besides meat and milk, goats also produce good quality skin, valuable *Pashmina* fiber and manure (Anon., 2014; FAOSTAT, 2015).

Livestock sector plays an important role in socio-economic development and the national economy of the country. The contribution of this sector (as of 2012-13) to the national economy in terms of Gross Domestic Product at constant and current price is 3.46% and 4.11% respectively. The share of livestock sector in GDP of total Agriculture, Fishing & Forestry (AFF) at constant and current price is 29.20% and 27.25% respectively. The goat sector contributes around 8% of the Gross Domestic Product (GDP) from livestock sector. In addition, the goat sector generates about 4% rural employment and about 20 million small and marginal farmers' and landless laborers' families depend on goats for their livelihood partially or completely (GOI, 2007; Anon., 2010; Anon., 2014*)*.

GOAT PRODUCTION SYSTEMS IN INDIA

In India, the minimum goat unit could consist of one goat and the maximum could go to a few hundred under range management. In general, the percentage of farmers keeping goats with a herd size of up to 5, 5 to 20, 21 to 100 and >100 are 15.9, 38.2, 43.9 and 2.00 per cent respectively (Thiruvenkadan *et al.,* 2000). The percentage of the farmers belonging to land-less, marginal (<2.5 acres), small (>2.5 to 5.0 acres) and medium land holders (>5 to 20 acres) are 39.0, 32.5, 26.5 and 2.0 per cent respectively (Thiruvenkadan, 2012a). In the prevailing socio-economic conditions in the country, where *per capita* land holding is hardly 0.2 h, goat rearing becomes an inseparable component of mixed farming system. The goats are reared by men and women with diverse working and professional background. The production systems are as numerous as the socio-economic and varied agricultural situations in the country. However, they can be broadly classified into the following categories:

- **Tethering**: This is common in the sub-humid and humid zones of India. It is a convenient means of rearing goats from the stand point of control, minimum labour input and utilization of feed *in situ*. It is thus a sedentary system. A variation of this method is combining tethering with grazing up to 5 goats at a time, led by ropes held by women and children.
- **Extensive production**: This involves low carrying capacity in situations where land is marginal and is plentiful. It is characterized by low rainfall and various browse plants. The system is used by nomadic people, usually in very low rainfall areas.
- **Intensive production**: The goats are fed in confinement with limited access to land. It involves high labor and cash inputs. Cultivated grasses and agro-industrial byproducts are fed *in situ*. This system also has the advantage of allowing control over the animals. This system is practiced in certain packets by the high income group.

• **Semi-intensive production**: This system is practiced to some degree in most of the situations, but the nature and extent of integration depend on the type of crops grown and their suitability to goats. The advantages of this system are increased fertility of land via the return of dung and urine, control of its herbage growth, reduced fertilizer usage, easier crop management, increased crop yields and greater economic returns (Thiruvenkadan and Rajendran, 2014).

Goats are housed only during nights. Housing pattern consists of open pens, half-open and closed sheds, which are well ventilated. The floor of the half open and closed sheds is kutcha in nature. The roofs are mostly made up of locally available materials. The goat shed are generally located near the houses of goat owners or housed in a portion of their residence. Kids are housed separately in a special, round enclosure made up of bamboo stalks, Palmyra fronds and thorny bushes to protect themselves from sun and rain. During kidding, confinement of the does is practiced by most of the farmers. The period of confinement after kidding varied from 1 to 5 days, but majority of the goat owners housed their does for 1 to 2 days after kidding (Thiruvenkadan *et al*., 2000).

Goats are allowed to browse extensively as a herded for a distance of 5 to 10 km for a period of eight hours in the forest areas, along roadsides, harvested fields and barren and uncultivated areas. In most of the villages, community grazing is practiced by mixing 4 to 5 herds, which are taken out for grazing / browsing together. The main sources of fodder are shrubs, lopped tree leaves, leaves from harvested crops and local weeds on the banks of dry and wetlands. There is a wide variation in availability of different fodder trees at different parts of India. Watering is done two or three times a day based on the season and availability. The major water sources are canals, local ponds or water drawn from wells. The kids are maintained with does' milk, local weeds, grasses, harvested crops and tree leaves up to three months of age. After three months of age, kids are allowed for browsing along with adult animals.

The major diseases affecting goats are goat pox, anthrax, enterotoxaemia, blue tongue, *peste des petits ruminants* (PPR), foot rot, brucellosis and foot and mouth disease. Animals of all the age groups are infested with lice, fleas and ticks. The major endoparasites affecting goats in India are *Strongyloides* sp., *Haemonchus* sp., *Chabertia* sp., *Bunostomum* sp., *Oesophagastmum* sp., and *Trichuris sp*.. In general, goats are vaccinated annually against enterotoxaemia, foot and mouth disease and *peste des petits ruminants.* Deworming is done to protect against endo-parasitic infestations and the preventive measures for ecto-parasites are taken in certain regions of the country in less number of the herds. In some of the remote areas, where the access of the Veterinary facility is difficult, farmers are carrying out ethano-veterinary practices using locally available herbs.

GENETIC IMPROVEMENT PROGRAMMES IMPLEMENTED IN INDIA

In order to improve the meat and milk production potentialities of different goat breeds of India several genetic improvement programmes have been implemented at different periods and are as follows:

All India Coordinated Research Projects on Goats (AICRP) : The All India Coordinated Research Project on Goats was started by Indian Council of Agricultural Research, New Delhi 1971 in the 4^{th} Five Year Plan, with the objective of improving the efficiency of milk, meat and fibre production by cross-breeding indigenous breeds with other better-producing indigenous breeds or high yielding exotic breeds. Crossbreds were mostly reared under intensive conditions. Under AICRP on goats, the milk component was implemented initially in two places viz., National Dairy Research Institute (NDRI), Karnal, Haryana and Kerala Agricultural University, Mannuthy, Kerala and then extended to other centers. In these centers, genetic improvement schemes have been initiated for improving the milk yield of native animals through crossbreeding with exotic breeds viz., Saanen and Alpine. Under meat component, the meat production performance of three north-western Indian

goat breeds viz., Sirohi, Marwari and Kutchi, were evaluated at the Central Sheep and Wool Research Institute (CSWRI) in Avikanagar, Rajasthan. One of the major objectives was to compare the pure-bred performance of the three breeds under semi-intensive and intensive management systems, although intensive feeding is not the norm in the field. Under the fiber component, cross-breeding of goats of the Angora breed was carried out at the Mahatma Phule Krishi Vidyapeeth in Rahuri, Maharashtra, to develop a composite Angora suitable for mohair production under local agro-climatic conditions. With the experience gained and information generated, it was decided to abandon crossbreeding in the 8th Five Year Plan (1992–97) and improve meat and milk production of indigenous breeds through within-breed selection.

The present AICRP scheme on goat improvement was conceived and initiated during 9th Five year plan with the main emphasis on improvement of goats involving farmers' herd in the home tract of different goat breeds and selection within the breed. The programme was based on involving the herds maintained at the Institutional farms (i.e., nucleus herd) and village herds maintained by the farmers. The farm units consisting of Institutional herds maintained under organized farm conditions include Jamunapari, Barbari and Sirohi breeds. Field units are based on the herds owned by the farmers maintained under village management system in the native home tracts and include Jamunapari, Marwari, Sirohi, Sangamneri, Surti, Black Bengal, Malabari and Ganjam breeds. During 11th Plan, five more field units on different goat breeds viz., Black Bengal, Osmanabadi, Gaddi, Assam Hill and Changthangi have been included (Swarup and Singh, 2011). The different units under progress in AICRP on goats are as follows.

Table 1. The different units under progress in AICRP on goats

Sl. No	Name of the Unit	Location	Utility
1	Jamunapari	Farm Unit, Central Institute for Research On Goats, Makhdoom, Uttar Pradesh	Milk & Meat
2	Barbari	Farm Unit, Central Institute for Research On Goats, Makhdoom, Uttar Pradesh	Milk & Meat
3	Sirohi	Farm Unit, Central Sheep and Wool Research Institute, Avikanagar, Rajasthan	Milk & Meat
4	Marwari	Field Unit, Rajasthan Agricultural University, Bikaner, Rajasthan	Meat
5	Black Bengal	Field Unit, West Bengal University of Animal and Fishery Sciences , Kolkata, West Bengal	Meat
6	Ganjam	Field Unit, Orissa University of Agriculture & Technology, Bhubaneshwar, Orissa	Meat
7	Sangamneri	Field Unit, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra	Meat & Milk
8	Surti	Field Unit, Navsari Agricultural University, Navsari, Gujarat	Milk & Meat
9	Malabari	Field Unit, Kerala Agricultural University, Trichur, Kerala	Meat & Milk
10	Sirohi	Field Unit, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan.	Meat & Milk
11	Black Bengal	Field Unit, Bihar Agricultural University, Ranchi, Jharkhand	Meat
12	Assam Hill	Field Unit, Assam Agricultural University, Guwahati, Assam	Meat
13	Gaddi	Field Unit, Himachal Pradesh Agriculture University, Palampur, Himachal Pradesh	Meat & Fibre
14	Osmanabadi	Nimkar Agricultural Research Institute, Phaltan, Maharashtra	Meat & Milk
15	Changthangi	Defence Research and Development Organisation, Leh, Jammu and Kashmir	Pashmina & Meat

Central Institute for Research on Goats (CIRG) : The Central Institute for Research on Goats is a premier research Institute of Indian Council of Agricultural Research (ICAR), an autonomous

organization under Department of Agricultural Research and Education, Ministry of Agriculture, Government of India. This institute was established on 12th July, 1979 to enhance and sustain goat productivity in respect of meat, milk and fiber through Research and Extension support. The mandate of the Institute is to undertake basic and applied research in all disciplines of goat production and product utilization, to impart trainings, to transfer technologies and provide consultancy services for improving quantity and quality of meat, milk and fiber production from goat and to develop goat products processing technologies. This institute is involved in improving the production performance of Indian goat breeds, viz., Jamunapari and Barbari through selection. Comparative performance studies on Sirohi, Marwari and Kutchi breeds of goats for meat and milk production under semi-arid climatic conditions of Rajasthan were also undertaken at Western Regional Research Centre (WRCC) of CIRG at Avikanagar, Rajasthan.

Indo-Swiss Goat Development and Fodder Production Project: The Indo-Swiss Goat Development and Fodder Production Project (ISGP) was started in 1981 in Rajasthan, with the objective of improving goat production through genetic improvement and increasing fodder production. This project was formalized through an agreement between the Governments of India and Switzerland and was implemented through the Rajasthan State Department of Animal Husbandry, with technical support from Inter-cooperation, Switzerland. Its main objective was to develop strategies for sustainable improvement of goat production in the semi-arid farming systems of Rajasthan to improve the income-generating capacity and nutrition of families belonging to the weaker sections of the rural community. Under this project, crossbreeding of Sirohi with Alpine and Toggenburg was undertaken to improve the productivity of the breed. It was observed that increase in milk yield was less than expected and hence, the crossbreeding was stopped and the project later on concentrated on selective breeding within the Sirohi breed. This project operated in 146 villages, with 677 goat keepers and 564 'poorest of the poor' goat keepers owning about 18,000 breedable does. However, the whole sector of small ruminants played only a marginal role in the state government livestock policy and hence by mutual consent, the project was terminated in 1992. The ISGP, proved for the first time in India that individual identification of goats and milk recording in the field was feasible, thus fulfilling an important condition for the establishment of a breeding programme (ISGP, 1990a; 1990b; de Groot *et al*., 1992).

Nucleus Herd of Different Goat Breeds: Nucleus herd of different breeds of goats are being maintained at different Research Stations of the State Veterinary and Agricultural Universities throughout India. They are implementing genetic improvement programmes for improving the performance of animals in the nucleus herds as well as improving the performance of the animals in the farmers' herds through Open Nucleus Breeding Schemes. In addition, ICAR- National Bureau of Animal Genetic Resources, Karnal is involved in characterization, evaluation and conservation of Animal Genetic Resources of India.

CONSTRAINTS FOR IMPROVEMENT OF GOAT HUSBANDRY IN INDIA

In spite of wider prospects of goat production in India, there are many constraints perceived by goat keepers and are as follows:

- Identification of elite breeding stock and implementing effective breed improvement programs at the farmer's field level.
- Goat production is facing a fodder scarcity due to shrinkage of grazing lands and increasing stocking rates, which adversely affect the productivity of these animals. It has been well documented that proper feeding is by far the most important factor hampering the productivity of goats.
- Lack of awareness to adopt improved technologies due to poverty, illiteracy and little or no say in decision making process of the goat owners.

- Goat farmers are exploited by the middlemen in marketing of surplus animals and sufficient modern abattoirs for slaughter of large number of animals are not available for export (Guljar *et al*., 2008; Thiruvenkadan, 2012b; Jana *et al*., 2014).

STRATEGY FOR IMPROVEMENT OF GOAT HUSBANDRY IN INDIA

Goat husbandry in India is recognized as an instrument for social and economic transformation of rural resource poor to a vibrant sustainable eco-friendly enterprise. There is great scope for rearing goats for meat production under semi-intensive and intensive systems of management. The following strategies have to be adopted to accomplish the vision and the goals to enhance efficiency and effectiveness of goat production in the country.

Genetic improvement programes: With shrinking resources and increasing demand of goat meat and milk, there is an urgent need to genetically improve and manage these animals through modern scientific tools to enhance their productivity. Although, there is a need to utilize between-breed genetic differences for higher yields, greater emphasis is required on improvement of adapted indigenous breeds/types because of valuable adaptive traits they have developed over long periods of time through natural selection.

- The productivity of different goat breeds in different production systems is different and therefore, makes it necessary to characterize and evaluate the performance of the different breeds in different production systems. This has been carried out in some of the breeds and the same has to be extended to other breeds also.
- Genetic diversity is a requisite for food security and stability of the environment. Unless genetic resources are conserved, genotypes that have unique desirable properties for production in a given environment may not be available to sustain food production now and in the future. The most viable option is conservation through utilization. To make conservation attractive and sustainable, the strategy must be associated with production objectives of the farmer.
- Structure breeding systems are important for the genetic improvement of goats in India. It is recommended that nucleus breeding programme for goats in India evolve towards an Open Nucleus Breeding, where the best females from the commercial population can be migrated up for breeding in the nucleus. This structure breeding programme has been implemented in certain recognized breeds of goats in India. The dilemma is how to effectively organize breeding schemes involving farmers at village level, how to record such herds and to monitor progress. To involve farmers, it is advisable to back the breeding programme with an effective extension service for maximum effect. Before initiation of the selection programme, it should be preceded with extension work to train the farmers and boost their experience and skills in goat production techniques.
- Identification of elite germplasm and establishment of seed stock production centers for important breeds of goats in their breeding tracts are needed for faster multiplication of elite germplasm for better growth rate. Identification and dissemination of superior germplasm under farm and field conditions has to be intensified in cooperation with various Animal Husbandry Departments under State Governments.
- Refinement of frozen semen technology and popularizing Artificial Insemination in goats for better use of superior germplasm is the need of the hour.
- Breed societies for most of the goat breeds are under dormant stage and they have to be rejuvenated and should get patronage, funding and scientific support for the conservation and sustainable utilization of goat genetic resources of India. These societies may function as an advisory body and should function independently.
- It is necessary to identify the most diverse and distinctive population by analyzing genome and population diversity at various level in both descriptive and non-descriptive animals. Advances in genomics and proteomics offer an opportunity to look at collective behavior of a large number of

genes under a given situation. Discovering novel genes/regulation mechanism of these genes, hitherto unknown, will help in understanding the molecular basis of adaptation and functional genomics for goat improvement.

- The possibility of estimating the breeding values of animals using modern statistical tools at field level has to be ascertained and implementation of marker assisted selection and genome-wide association studies at farm and field conditions have to be explored for faster genetic progress.

In general, the success of most improvement programmes is generally not determined by their inherent structure, but by their compatibility with the breeding objective of the farming system and the involvement of farmers. It is prudent to examine the production system holistically and involve the producer at every stage in the planning and operation of a breeding programme, integrating traditional knowledge, practices and values. Therefore, involvement of farmers at any stage in the design and operation of the scheme would be imperative (Kosgey, 2004; Thiruvenkadan and Rajendran, 2013; Mandel *et al.,* 2014).

Nutritional and feed processing programmes: There is a need to optimize the use of available feed resources as well as developing cost-effective feeding regimes and formulations for improving goat production under different livestock production systems. In order to overcome the feed scarcity due to shrinkage of grazing lands and increasing stocking rates, development of economical balanced diets and supplement formulations specific for different regions and breed of goats are needed. The Biotechnological interventions and nutrigenomic studies for understanding the impact of nutritional strategies and feed conversion efficiency at the genetic level needs to taken up.

Goat Health: Occurrence of diseases causes heavy economic losses in terms of livestock health and production. Advances in animal health are expected to play a major role in the progress of livestock industry. Control of animal diseases assumes prime importance in the crucial time of shifting of animal agriculture from extensive to intensive and commercial system of management. Presence and accumulation of infectious agents in the environment leads to reduction in quality and quantity of animal products. Strategic control and eradication of economically important diseases will result in enhancing goat production in the country. The strategy needed for improving the goat health conditions are as follows:

- Development of new generation diagnostics and vaccines along with appropriate adjuvant and improved delivery system for the endemic, emerging and exotic diseases of goats will be the major thrust area in the coming decade.
- Another important thrust area would be development of formulations from herbal/synthetic sources against economically important goat diseases- in view of the increased resistance of pathogen to antibiotics and anthelmintic and ecto-parasitic drug molecules.
- Due to increased resistance of pathogens (bacteria and parasites) to drugs and pharmaceutical and rapid increase in cost of medicines, emphasis has to be given to strengthen and increase as well as building up of 'herd immunity' by selective breeding with respect to certain disease resistance genes in case of chronic and parasitic diseases.
- Establishing National Referral Centre on Goat Health at national level with all modern equipment for better disease diagnosis.
- GIS and ICT based surveillance, monitoring, forecasting, diagnosis and control of economically important goat diseases including caprine zoonoses.

Goat Meat and Milk Processing: The development of a sustainable, scientific, environment friendly and animal welfare oriented goat management system based on principles of clean, green and ethical animal production is needed. Processing and value addition of goat meat and milk products as well as by-products is urgently required. Similarly, entrepreneurship program for processed meat needs to be initiated and encouraged. The strategy needed for goat products are as follows:

- Developing appropriate cost-effective processing technologies for production, popularization and commercialization of shelf- stable value added goat meat and milk products with health promoting characteristics.
- Packaging and shelf life evaluation of goat meat and milk products under different storage condition. For commercial exploitation of the value added goat foods, development of shelf stable products assumes greater importance and work has to be carried out in this direction.
- Quality evaluations of different goat skin and processing technologies have to be standardized for its value addition.
- Evaluation of medicinal properties of goat milk and its promotion as nutraceutical are also needed. The value addition of the goat foods through the development of newer biotechnological and nano-technological approaches would bring in a new era of foods that would address the future needs of the society.

Farming system and extension programs: The global economic and business environment is undergoing rapid changes that will have far reaching impact and implications for the goat sector in India. Understanding the market and preparing itself to respond to emerging market trends would be the prime instrument for enhancing the domestic livelihood opportunities in the goat sector.

- As the goat farmers are mostly unorganized and scattered and belong to the lower strata of the society, it is imperative to streamline the goat milk collection by establishing milk sheds in the home tract regions of the different milk breeds of goats especially in the states of Uttar Pradesh, Rajasthan and Gujarat. This can be achieved through establishment of goat producers/breeders co-operative societies in the line of milk producers' co-operative societies. Such efforts will ensure supply of goat milk in bulk for industrial use and also augment the production of healthy goat milk and milk products.
- Human resource and entrepreneurship development through training and consultancy is needed for better goat husbandry activities. ICT mediated extension approaches to strengthen linkages with large number of farmers to assist transfer of technologies and address goat farmers' problems. Promoting Public Private Partnership (PPP) for entrepreneurship development has to be made.
- Provision of extension and veterinary services are a major pre-requisite for effective breeding programs and are one of the major constraints in India as well as other developing countries in tropics.
- Facilitating Goat Market Federation involving farmers, micro-financers and commercial agencies for remunerative return to goat farmers. Formation of farmers associations and development of marketing facilities would help farmers get better prices for their animals and or products
- Creating Information System (IS) and database on goat marketing and available practices for farmers
- Forage and range development programs should be instituted and implemented by involving local stake-holders, particularly goat breeders. The common grazing lands are fallows, forest areas, permanent pasture and wastelands. Due to depletion of these areas in the villages, promotion of fodder trees at farm premises and also in watershed areas with suitable agro-forestry model is highly warranted. Establishment of silvipasture system in the waste and uncultivable area will be helpful for increased fodder availability to the goats.
- Community pasture lands have been depleted and about 60% of them are unproductive due to excessive grazing and heavy soil erosion. As a result, the pastures are not only lying idle but also posing a threat to agriculture and environment. Hence, a program for motivation of people, awareness about the need for conserving the pastures, formation of a Pasture Development Committee, soil and water conservation measures on pasture lands and introduction of forage and shrub species are needed to increasing the stocking density.

CONCLUSION

Goat is one of the important animals serving the mankind in several ways by producing milk, meat, fibre and valuable by-products such as skin and offal's. They substantially contribute to the rural economy and provide livelihood to the poor masses and supplement their food with nutritious milk and meat. Economic and social importance of goats for the rural poor demands large research and development investment, hence national governments and international agencies should support goat production in India. There is need for greater regional and international co-ordination in research and development programs for goats to allow exchange of information, germplasm, diagnostics and immunization. Breeding strategies contribute significantly to improving livestock production efficiency, by enhancing the productive and reproductive performances of livestock. Thus to improve the goat productivity in the country, a need- based location-specific strategy must be developed and implemented keeping in view the availability of resources and utility of breed in different agro-ecological zones of the country. Molecular genetic evaluation of indigenous goats for traits like thermo-tolerance, disease resistance and genetic disorders for improving the overall adaptability in view of the impending climatic change. In addition, capacity building of goat farmer by providing suitable training and inculcating entrepreneurial characters will help in livelihood security and in turn, it will pave the road of holistic economic prosperity. Strengthening market intelligence, entrepreneurship development, commercialization and transfer of technologies will help the farmers in better income generations. The future of goat breeds in India lies in the appropriate approaches to conservation, combining a number of integrally related components and effective action programmes approached holistically for successful conservation of goat genetic resources. To address these issues and ensure impact, the way forward will necessitate a wider recognition, better resource use, strong interdisciplinary approaches and institutional support to ensure the future contribution of goats in India as well as other developing countries.

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Lienminh Chicken Breed: Native Breed and Livelihood of People on District-Island Cat Hai of Hai Phong City, Vietnam

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ABSTRACT

In Vietnam, besides the exotic breeds, native chicken is not only more and more plays important role in household economy, but also perform other functions, in support of the cultural, social in the last years and in special in the context globalization in recent future of developing country. The characterization and evaluation of the role of native chicken as Lienminh breed in livehoods of Vietnamese is necessary for the strategy of conservation and use the native chicken genetic. In order to determine the general information related the status and economic efficiency of Lienminh chickens production. A cross-sectional study was conducted on 30 households who raising Lienminh chicken in Cathai Island by using semi-structured questionnaire. For morpho-biometric characteristics was identify in 200 adult chickens according to FAO standards. For economic-technical parameters was determined on 100 broiler chickens (50 males and 50 females) from hatching to 16 weeks in the hothouse in the same local. The research results show that, about 54% Lienminh breed present in the chicken population in Cathai district, most of them are raised in backyard. The farmer fed average about 30g of feed/day/ chicken. Lienminh breed was characterized by colors, most of the roosters' feathers (95%) were reddish-brown, and light yellow for the female. At the adult's age, the mean weight of male and female were, respectively, 4,0 – 4,3 kg and 3.2 to 3.4 kg. The yield of carcass, thigh and breast meat are respectively, about 70.53 ± 3.86 %, 18.24 ± 1.15 %; and 17.06 ± 1.09 %. The meat quality was especially excellent (evaluate by consumer local) and the price was 2.5 – 3,0 times higher than that of other exotic chicken breeds. The age at the first egg are at 28 weeks; with body weight of about 2.25kg. Mean of Yearly egg numbers were 75.6±6.6 eggs. The rate of hatching eggs were 85.55±9.32%. The economic efficiency of Lienminh chicken production is higher than others exotic breed, it will increase the income significantly and contribute to poverty reduction for local people.

Key Word: Native Chicken, Morpho-Biometric, Lienminh Chicken Breed, Vietnam

INTRODUCTION

According to the final report of the Committee for Ethnic Minorities and Mountainous Areas, the proportion of poor households in particularly poverty-stricken communes, and villages in 369/690 districts of 50/63 provinces of VN decreased from 35% (2010) to 18.8% (2014). The averageincome per capita in the communes of the program reached 6.2 million VND/person/year, which was only 15% as much as that in the urban and 21% in the rural areas in the lowland. One of the important income of the island residents is from specific and high-qualified indigenous products.Poultry breeding contributed approximately 50% to the total income of farm households (Maltsoglou & Rapsomanikis, 2005; Burgos et al., 2008). These breeds were high-priced, stable and suitable to the taste of customers thanks to their high adaptability, consistence with cultural practices and farming methods and high quality. Thus, the breeding of indigenous livestock has received due concern from the authorities and been considered one of the important factors not only to stabilize the livelihoodsof the people in the island areas but also to protect biodiversity and genetic diversity, contributing to the sustainable development of Vietnam's breeding industry. In

order to create a basis for the recommendation and development orientation for indigenous chicken in general and Lienminh chicken in particular, it is crucial to assess the role of native indigenous breeds (Lienminh chicken) to the people in the Cathai island in the Northeast region of Vietnam.The purpose of research was determined the situation, farming methods and some biological characteristics and the ability to produce the Lienminh chicken in the conditions of backyard farming of the island residents in the Cathai island.

RESEARCH METHODOLOGY

A cross-sectional study was conducted in order to assess the situation as well as the biological characteristics, productivity of the multi-spurred breeds in the condition of households island residents groups in Cathai island, Haiphong city in the Northeast Vietnam. Thirty residents households who are raising Lienminh chicken in Tranchau commune, Cathai Island, Haiphong city were involved in the research. The chicken breeding conditions and some characteristics related to the distribution, breeding techniques as well as appearance characteristics were assessed through both direct and indirect methods (observe directly and collected by questionnaires)from the households. The characteristics of chicken were descripted in using the observation directly, photography method from 200 Lienminh chickens following FAO standards.

The productivity of the Lienminh broiler chicken were determined from three lots(n=100) (50 females, 50 males from 0 to 16 weeks of age) raising same condition and free as the actual conditions household. For the chicken from 0 to 3 weeks were housed and fed ad libitum with available feed in local such as corn, rice, soybean and premix. The chicken from 4 to 12 weeks were allowed to go out for grazing and fed on demand 2 meals/day (table 2.1). Carcasses evaluation were determinated as the method described by the Working Group 5 of World Poultry Science Association (WPSA, 1984). The data collected is statisticallyanalysed by Minitab 14.

The fertility and productivity of the free-grazing Lienminh hen were evaluated by analyzing the data and information related to the fertility of 100 hens from 20 weeks old which are collected daily by both researcher and farmer). The monitoring indicators included age of first egg laying (day), the average number of eggs/brood and the productivity of a hen per year. The proportion of fertile eggs (%), the percentage of hatched eggs/incubated eggs (%) and the percentage of hatched eggs/fertile eggs (%) was determined on the basis of monitoring 50 nests using natural incubation

Table 1. Experiments design

Item	Description
Household	3
Chickens/household	100
Male/female	1/1
Nourishing time (week)	16
Chickens for Slaughter	5 male and 5 female

RESULTS AND DISCUSSION

General information of native chickens production in Cathai Island

The research show that the "Lienminh" chickens breed were the most commonly raised (represent 54.40%) in Cathai island, Haiphong city. Meanwhile, although considered local about the

multi-spurred chickens production but the multi-spurred chickens represent only 45.6%. This results show that Lienminh chickens were rare, and specially received concerns, investment and care. Specially, currently Lienminh chickens are raised free grazing.

The local chicken (Lienminh)is raised in household under a condition scattered, small-scale and extensive, with the popular scale below50 chickens/households (13.6%) and from50 to 70 chickens/households (80.4%). There are very few households which raised over 70 chickens (only 6.0%).

In general, male and female Lienminh chicken had average weight about 4.0kg – 4.3kg and 3.2kg – 3.4kg,respectively, well-proportioned body, small and round head, high neck.The appearance traits of Lienminh chickens were somewhat similar to those of Ri chicken, i.e. the feather colors were reddish brown in males (95%) and golden brown or light yellow in females (92%). The majority of both breeds (100%) were single-combed.

Table 2. Population herd of Lienminh chicken in households

Chickens/households	Percent (%)
< 50	13,6
50 - 70	80.4
>71 - 100	6.0

In Cathai Island, the age of the reproductive chickens was relatively old. Reproductive chicken from 2 to 3 years of age represent in42.17% households and5.2% households use Lienminh chickensover 4 years for reproduction. The results of this study were similar to those of Moula and et al (2001) when surveying the Ri raising in households which showed that hens were kept for 3 or 5 years for reproduction. As other local good looks, good fertility and productivity to keep as breed for breeding. These habits could be the reason why the production capabilities of this breed were low.

Table 3. The age of the reproductive chickens

Nourishing time (years)	Herd of Lienminh chicken		
	Male	Female	Mean (%)
<2	43.48	40.78	42.17
2 to 3	38.26	37.22	37.74
3 to 4	13.04	16.83	14.93
>4	5.22	5.18	5.20
Total	100	100	100

Addition, all most of household apply the method of freely-grazing.Especially, 80% of the households in Cathai did not build hen-houses only 20% households build chicken housewhich were mainly made from available rough materials such as wood or bamboo. In these households, in daytime chicken grazed freely and at night they slept under the floor, in a pigsty or on the trees.The absence of hen-houses along with the freely-grazing adopted as main breeding method made it

difficult to manage and prevent diseases. When epidemic occured, it was impossible to keep the chicken isolated.

The survey results show that 100% of the nursing hens were fed with rice and milled corn as additional feed. Besides, the hens took the chicks out to pick insects, ants, worms, termites, and so on for feed. As for the adult chicken, in daytime they were freely grazing in the surounding gardens, hills or fields. In the evening, chicken were fed with additional feed available in the household, such as maize, rice, cassava, rice and so on with an average feed of 30g/individual/day. It it remarkable that at harvest times of rice and maize (2-3 times/year) when feed were available, chicken were foraging in nearby rice or maize fields or drying grounds for straw, or corn cobs, dried maize, rice etc. Thus, at such times chicken were not fed with additional food but they still grew up fast with good lookings and were sold with really high price.

Vaccination and disease treatment

The study show that the rearer used Newcatle vaccine and antibotic for disease treatmnet 100% and 66% of total households, respectively, especiallythe rearer did not use drugs for parasites disease treatment. In the fact that, with lowhygienic environment, the local rarely occur disease which clearly can be explain because ofbettwen of households farm almost is far distant (500 metters) and civil in island rarely buy chicken from other location and their only exchange yields from farm each other.

Fertility

The research results showed that hens matured in 197.5 days (at 28.7 week of age) with body weight of 2.25 kg. Lienminh hens laid averagely 12.07 eggs/brood, 5.95 broods/year and 75.60 eggs/hen/year, with the average egg weight of 49.80 g/egg. In general, breed had an below average fertility compared to other indigenous breeds already studied, yet much lower than industrial chicken. Due to the hens' strong instinct of incubation, it was difficult to develop the flock size for large-scaled breedings.

Table 4. Reproductive indicators of female Lienminh chickens

Indicators	**Unit**	**Value***(n=50)*
		$\overline{X}$ **± SE**
Weight of mature hens	kg	2,25 ± 0,74
Age of maturity	day	197,5 ± 23,44
Eggs/brood/hen	egg	12,70 ± 7,06
Brood/hen/year	brood	5,95 ± 1,34
Eggs/hen/year	egg	75,6 ± 6,6
Egg weight	gram	49,8 ± 1,98
Egg morphological indicator	-	0,78± 0,32
Yolk	Roche	9-11
Breeding	%	100

Remarkably, the results of field studies also disclosed that 100% of the people in the locality kept the hens for breeding within the flock with an unchanged rooster. In terms of extremely small flock, the inbreeding is unavoidable and considerably dangerous.

In compration other native chicken, Ho chicken matured in 328.8 days (at 41,1 week of olds) with body weight of 2.56 kg. Ho hens laid averagely 13 eggs/brood, with the average egg weight of 52.53 g/egg.Mia chicken matured in 214.4 days (at 26.8 week of olds) with body weight of 1.72 kg. Mia hens laid averagely 13.4 eggs/brood, with the average egg weight of 42.16 g/egg. (Nguyen Chi Thanh and *et al*, 2009).

Arcoding to Eaton and *etal* (2006) the Ri chiken matured in 204.8 days (at 25,6 week of olds) with body weight of 1.3 kgwith the average egg weight of 45.2 g/egg.H'Môngchiken matured in 167.2 days (at 20,9 week of olds) with body weight of 1.43 kg. H'Môngchickens laid averagely 16.53 eggs/brood, and 51.67 eggs/hen/year (Do Thi Kim Chi, 2011).

The result show that the Lienminh chicken reached sexual maturity earlier than other native breeds as Ho chikens but later than Mia, Ri, H'Môngchickens. Weight at maturity age was average. The number of eggs/brood/hen was similar to that of the Ho and the Mia.

The traits of eggs of Lienminh chickens: egg morphological indicator was 0.7-0.8, rather small in size, thin, with shell in white, pinkish or brownish yellow, and dark-colored yolk, which was much to the customers' liking.

The rate of fertile eggs were considerably high (94% - 95%). Due to the natural conditions and instinct of incubation of the hens, the rate of hatched eggs was not very high, only accounting for 84%- 85%. The rate of hatched eggs/fertile eggs was 90% - 91%; and the weight of the newly-hatched was 32g – 35g

Table 5. Fertile indicators of female Lienminh chickens

Indicators	**Unit**	$\overline{X}$ ± SE	Cv (%)
Fertile eggs	%	93,58 ± 0,59	9,34
Hatched eggs	%	85,55 ± 0,67	11,45
Hatched eggs/fertile eggs	%	90,75 ± 0,47	7,65
Weight of the newly-hatched	g	33,85 ± 0,19	3,76

Productivity of Lienminh chicken breeds

The survey result (Table 6) show that Lienminh chickens were at highest risk of death at the first week of age. After 9 weeks chicken hardly die. In 16 weeks, the survival rate is 89.5%. Arcording to Nguyen Chi Thanh and *eta,* In 12 weeks,the survival rate of Ho chicken, Dongtao chicken, Mia chicken are90.79%, 92%, 76.37%, respectively. In 8 weeks,the survival rate of H'Môngchicken is 78.76% (Tran Hue Vien, 2006) and Ri chicken is 84.5% (Moula and *etal*, 2011).

At 16 weeks of age, the average weights Lienminhmale chickens and female chickens were 1763g and 1553g respectively.The results (Table 7) show that the body weight of Lienminh chicken was similar to H'Môngchicken and Ri chickens at 12 week of olds but lower than other native chicken: the body weight of male Ho chickens and female are 1152g and 1150g,respectively.The body weight of male Dongtao chickens and female are 1386g and 1276g,respectively.

Table 7 shows that the carcass proportion of Lienminh chickens was 70.53%, in which thigh and breast meat constituted 18.24% and 17.06%. The thigh proportion is higher than breast proportion because of the chikens were raising at freely grazing condition. Which is appropriate habits of Vietnamese.

Effectiveness of multi-spurred chicken's backyard breeding

Lienminh chicken breed were specialties of Vietnam which were high-qualified, well-sold, high-priced, 2-3 times higher in price than other indigenous breeds.

As local chickens were well-sold with high price, in recent times a number of households were trained how to promote their breeding in order to develop this breed locally. Although the chicken flocks were rather small, they played an important role in the livelihoods of the local people, such as providing meat and eggs as well as being a financial source for many families in cases of emergency: tuition for children, hospital fees and so on.

Table 6. The body weight of Lienminh chickens (n=30)

	Value*(n=30)*			
Week of olds	$\overline{X}$ ± SE (grams)		Cv (%)	
1	38,433 ± 0,133		4,60	
2	86,77 ± 1,5		4,99	
3	137,83 ± 1,91		5,39	
4	207,73 ± 1,56		6,30	
5	270,73 ± 2,16		5,38	
6	328,03 ± 1,11		6,58	
	Male		Female	
	$\overline{X}$ ± SE	Cv (%)	$\overline{X}$ ± SE	Cv (%)
7	472,1 ± 9,1	6,34	465,4 ± 11,5	5,27
8	573,7 ± 16,2	5,90	539,8 ± 10,4	6,33
9	735,1 ± 15,4	4,64	703,6 ± 10,1	5,49
10	844,1 ± 9,96	6,04	826,6 ± 13,6	6,84
11	953,4 ± 12,8	7,32	927,1 ± 12,8	4,39
12	1048,6 ± 12,2	6,01	1030,4 ± 9,23	5,55
13	1163,5 ± 11,7	7,74	1138,2 ± 9,06	7,38
14	1394,9 ± 17,8	7,27	1375,3 ± 7,96	5,06
15	1535,7 ± 14,3	6,72	1474,5 ± 11,0	5,36
16	1763,2 ± 8,85	7,98	1553,6 ± 18,6	5,21

Table 7. The body composition of Lienminh chicken

Trait	Lienminh chickens (n=5)		
	Male $\overline{X}$ ± SE	Female $\overline{X}$ ± SE	Mean
Body weight (g)	1788,00 ± 69,74	1594 ± 57,09	1691,33
Carcass(g)	1255,35 ± 10,79	1129,35 ± 11,27	1192,67
Carcass proportion (%)	70,21 ± 0,11	70,85 ± 0,15	70,53
Leg muscle weight (g)	230,42 ± 0,35	204,57 ± 0,37	217,42
Thigh proportion (%)	18,36 ± 0,02	18,12 ± 0,05	18.24
Breast muscle weight (g)	212,72 ± 0,35	193,85 ± 0,27	203,35
Breast muscle proportion (%)	16,95 ± 0,03	17,17 ± 0,03	17.06
Thigh and breast meat weight proportion(%)	35,31	35,29	35,30

CONCLUSION

In cathai Island, Lienminh chickens is rare and valuable local breeds which play an important role in the livelihoods of the local people. This chickens breed were the most commonly raised (represent 54.40%) and is raised in household under a condition traditional: scattered, small-scale, extensive and freely grazing condition.

Because of freely grazing condition, the meat quality is excellent, very sweet-smelling and delicious, so the selling price is 2.5-3 times more expensive than that of other chicken breeds. But in the condition of small scale, inbreeding was unavoidable, which was significantly dangerous.

Therefore, if it is adequately supported, backyard farming of Lienminh chicken will bring about high profit and sustainable development, contributing to the sustainable livelihoods of cathai island.

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Selected Plant Phytobiotics Feed Additive Based on Antimicrobial Property and Application in Meat-Type Duck

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ABSTRACT

Several herbs have been evaluated on the possible use as phytobiotics feed additive in chickens, but information with regard of comparative antibacterial activity of tumeric, white tumeric, javanese ginger and black ginger is elaborated. Attempt has been made to examine response performances of addition of herb extract that has the highest antibacterial activity in meat-type duck. The aims of research were to examine antibacterial activities on several herbs extract toward*Escherichia coli*, and to find the best level of selected herb water extract use on performances of meat-type duck. The result was expected to contribute knowledge on the use of herb water extract for meat-type duck. The research was divided into 2 parts, in the first part was to evaluate antibacterial activity of herbs and the second part was to biologically test the use of selected herb on meat-type duck performances. In the first experiment, there were 6 treatments namely A0 Aquadest 100 %, A1 antibiotic tetracycline+ Erythromycine, A2 tumeric extract, A3 white turmeric extract, A4 javanese ginger extract and A5 black ginger extractin which the responses to inhibit *Escherichia coli*were tested. Variablesmeasured were Minimum Inhibition Concentration (MIC) and Minimum Bacterial Inhibitory Concentration (MBIC) testagainst *Escherichia coli*. The result showed that use of turmeric extractgave highly significant on MICagainst*Escherichia coli* (P<0,01), further test indicated as low as 50 % (w/v) concentration of turmeric extract was enable to showed as MBIC against *Escherichia coli*. The second experiment was dealt with 5 dietary treatments (P0 (basal feed), P1 (basal feed+antibiotic), P2 (basal feed+turmeric extract 0.7 ml/duck/day), P3(basal feed+turmeric extract 1.4 ml/duck/day)and P4 (turmeric extract 2.1 ml/duck/day)) with oral treatment on performances of hybrid duck. Variables in this research were feed consumption, body weight gain, feed conversion and IOFC. The result of this research showed that the use of turmeric extract with oral treatment highly significantly affected feed consumption, body weight gain and IOFC (P<0,01), significantlyaffected feed conversion ratio (P<0,05). The conclusion of this research was among the herbs selected turmeric extract showed the highest diameter of zone inhibition if challance against *Escherichia coli* with MBICof 50 % (w/v), and 2.1ml/duck/day oral treatment of turmeric extract could increase performances of meat-type duck.

Key Words: Antibacterial, Turmeric Extract, Meat-Type Duck, Performances

INTRODUCTION

Removal of antibiotic from poultry diet may consequently influence productivity and health status. Worrying about decline in egg and meat productivity is particularly due to physiological changing in digestive physiology probably leading to less effective digestion and absorption. Declining healthiness of poultry is of another concern because of development of unexpected pathogenic microflora. On the other hand, pressure on production of healthy products with containing no residual medicinal drugs or antibiotics.

Current development of poultry raising relies on antibiotic free diet. Such steps need to be supported with findings on the use of additives enable to replace the role Antibiotic Growth Promoter (AGP) without affecting performances of poultry. Probiotic, prebiotic and phytobiotic have been proposed to take over the role of AGP in poultry diets. With herbs that has long been used as

traditional medicine particularly in Asia, active substances have been reported to have antibacterial activity. Among them, comparison of some herbs particularly with regard to diameter inhibition zone and minimum inhibition concentration have not been established yet. This experiment is intended to compare antibacterial activity of some herbs against *Escherichia coli*.

On the other hand, hybrid duck as crossing between Campbell and Peking Duck, probably also with other local duck as well, has developed in the Indonesian farmers. Duck has played a significant role in providing poultry meat although it is not as high as the contribution of broiler meat. Statistical of Directorate of Livestock (2011) indicated that the population of duck was more than 45 million birds. Most of them are laying-type duck, and only 5-10% is estimated to be meat-type ducks and male laying duck that have been raised for meat production. Millions of farmers are involved in the business of duck production. Therefore, developing good and practical feed additive that may contribute toward improvement of farmer's income is attempted.

Evaluation of natural feed additive is currently under study of many researchers in any part of the world. While the use of AGP is considered to be having side effect like allergy due to residual AGP remains in the poultry product, disturbs microbial balance in the intestine and the possible development of resistant toward AGP (Bogaard and Stobberingh, 1999; Mello, 2000).The form of application of herb feed additive is usually a blend of several herb extract (Sirvydis *et al*, 2003) added in the mash form showed a tremendous result. Current experiment is elaborated the use of single herb based on the antibacterial property assessment to be implemented in orally dosed for meat-type duck. This step might not be of practical but it could avoid unnecessary active substance(s) loss. Effectiveness of herb extract relies on the contents of active substances like alkaloid, flavonoid, glikoside, saponin, terpenoid and tannin which suppose to improve health status and productivity (Sreenivas, 1999).

MATERIAL AND METHOD

First Experiment

This aim was to select antimicrobial activity of turmeric, white turmeric extract, Javanese ginger (temulawak) and black ginger (temu ireng) extract. The extract was prepared by directly squeezing the fresh herb and thereafter filtering. This experiment was carried out in the Laboratory of Microbiology Facultyof Medicine University of Brawijaya Malang

Materials

Materials used consisted of turmeric, white turmeric extract, javanese ginger (temulawak) and black ginger (temu ireng) obtained from the market and selected of medium size.In addition, bacteria of *Escherichia coli* and media of Mueller Hinton Agar (MHA) for antimicrobial test were obtained from Faculty of Medicine and local chemical store, respectively.

Method

Method of research was *in vitro* experiment arranged in Completely Randomized Design consisted of 6 treatments and 4 replications. The treatments are as follows:

A0 : Aquadest (negative control)
A1 : Antibiotics (Tetracycline + Erythromycine) (positive control)
A2 : Extract of Turmeric
A3 : Extract of White Turmeric
A4 : Extract of Javanese Ginger
A5 : Extract of Black Ginger

Measurements of Minimum Bacterial Inhibitory Concentration (MBIC) and Minimum Inhibitory Concentration (MIC) followed the procedures of Pupimadita *et al.* (2010).

Data Analysis

Data were tabulated and analyzed based on Completely Randomized Design consisted of 6 treatments and 4 replications. If significant, the Duncan Multiple Range Test was applied (Yitnosumarto, 1991).

Second Experiment

The aim was to implement application of selected herbal extract, which was turmeric, dosed orally to meat-type duck, which is in Java known as Hybrid Duck crossed between male Peking duck and female Khaki Campbell duck but possibly also has been crossed with local duck like Mojosari duck and evaluate the performances especially feed consumption, body weight gain, feed conversion ratio, mortality and Income Over Feed Cost (IOFC).

Materials

The materials used consisted of extract of turmeric, 1202-weeks old hybrid ducks and battery cages to suit 6 ducks per unit of a total 20 units. Basal diet used was as showed in Table 1.

Table 1. Basal feed composition and its nutritional contents

Feed Ingredients	Starter	Finisher/Basal diet
Yellow corn (%)	55.83	70.54
Rice polishing (%)	9.86	9.62
Soybean meal (%)	23.26	12.83
Fish meal (%)	9.31	5.13
Bone meal (%)	0.00	0.86
Coconut oil (%)	1.12	0.64
Premix (%)	0.19	0.21
Lysine (%)	0.19	0.09
Methionine (%)	0.06	0.09
Total	100	100
Nutrient contents		
Metabolizable Energy (kkal/kg)	2946	3030
Crude Protein (%)	22.37	16.46
Calsium (%)	5.02	5.43
Phosphor (%)	4.53	3.93
Lysine (%)	0.65	0.60
Methionine (%)	0.43	0.37

Method

The method of research was experiment employing 5 treatments and 4 replications. The treatments were as follow:

P0 :Basal Feed
P1 :Basal Feed + Tetracycline + Erythromycine (300 mg/kg feed)
P2 :Basal Feed + orally dosed 0.7ml of turmeric extract/day
P3 :Basal Feed + orally dosed 1.4 ml of turmeric extract/day
P4 :Basal Feed + orally dosed 2.1 ml of turmeric extract/day

Procedure of research

Extract of turmeric was prepared one in three days, store in the refrigerator. Oral administration of turmeric extract for each duck was delivered daily in the morning by using injection spuit. The feeds consisted of starter diet (0 – 2 weeks of age) given only before the treatments, while the finisher diet (2 – 6weeks of age) was then called as basal diet for this research.

The variables measured were feed consumption, body weight gain, feed conversion and IOFC (Income over Feed Cost).

Analysis Data

Data were analyzed by using ANOVA of Completely Randomized Design; the significant effect was further tested by using Duncan Multiple Range Test (Yitnosumarto, 1991).

RESULTS AND DISCUSSION

First Experiment

Effect of several plant phytobiotic additives on Minimum Inhibitory Concentration (MIC) against *Escherichia coli.*

Table 2. showed the summarizing effect of several plant phytobiotic additives on Minimum Inhibitory Concentration (MIC) against *Escherichia coli.*

Table 2. Effect of several plant phytobiotic additives on Minimum Inhibitory Concentration (MIC) against *Escherichia coli*(Rahmawati *et al*., 2014)

Treatment	Diameter of Inhibitory Zone (mm)
A0	6.01 ± 0.01^{a}
A1	16.97 ± 0.03^{f}
A2	11.64 ± 0.25^{e}
A3	8.02 ± 0.01^{b}
A4	9.95 ± 0.01^{d}
A5	9.11 ± 0.01^{c}

Note: a – f indicated highly significant different effect (P<0.01)

The Table 2. showed that all plant phytobiotic additives have an antibacterial activity as compared to negative control, but such effect was not as strong as antibiotic containing group (A1). Among the plant phytobiotic additives, turmeric showed the most superior effect. Cikrici (2008)also reported that curcumin was effective to inhibit growth of *Escherichia coli*. Davis and Stout (1971) said that diameter of inhibitory zone of 10-20 mm is classified as having strong inhibitory effect.

Effect of several plant phytobiotic additives on Minimum Bacterial Inhibitory Concentration (MBIC) against *Escherichia coli.*

Table 3. showed a summarizing effect of plant phytobiotic additive on Minimum Bacterial Inhibition Concentration (MBIC) against *Escherichia coli.*

Minimum Bacterial Inhibitory Concentration (MBIC) test according to Pratiwi (2008) is aimed to know minimum concentration by which a substance is enable to inhibit growth of *Escherichia coli*. The results of Tabel 3.Indicated that turmeric extract showed an activity to inhibit *Escherichia coli*at minimum concentration of 50% (50 v/v)to the strongest inhibitory effect at 100%. Curcumin in turmeric has been reported to have wide spectrum activity to kill gram positive and gram negative bacteria, virus, and enable to induce apoptosis of tumor cel (Bermawie, 2006).

Table 3. Effect of plant phytobiotic additive on Minimum Bacterial Inhibition Concentration (MBIC) against *Escherichia coli.*(Rahmawati *et al*, 2014)

Concentration Of Turmeric	Replication				CFU/ Plate
	I	II	III	IV	
0%	+	+	+	+	$3.1x10^7$
50%	-	-	-	-	$2.7x10^7$
60%	-	-	-	-	$2.3x10^6$
70%	-	-	-	-	$2.2x10^6$
80%	-	-	-	-	$1.4x10^5$
90%	-	-	-	-	$9.3x10^4$
100%	-	-	-	-	$4.6x10^3$

Note:
+ : cloudy (no inhibition)
- : clear (inhibit)

Effect of turmeric extract on performances of meat-type duck

Table 4. showed a summarizing effect of turmeric extract on performances of meat-type duck.

Table 4. Effect of turmeric extract on performances of meat-type duck (Rahmawati *et al.*, 2015 submitted)

Variable	Traetment				
	P0	P1	P2	P3	P4
Feed Consumption (g/duck/28 days)	1879 ± 45^{a}	1874 ± 16^{a}	2057 ± 15^{b}	$2071 \pm 46{,}64^{b}$	2056 ± 52^{b}
Body weight gain (g/duck/28 days)	483 ± 25^{a}	430 ± 51^{b}	500 ± 31^{ab}	630 ± 25^{c}	630 ± 51^{c}
Feed Conversion	4.08 ± 0.32^{qr}	3.78 ± 0.29^{pq}	4.20 ± 0.35^{s}	4.25 ± 0.40^{s}	3.63 ± 0.12^{p}
IOFC (Rp/duck/28 days)	2545 ± 716^{b}	1417 ± 1078^{a}	2166 ± 605^{ab}	4956 ± 662^{c}	5033 ± 1152^{c}

Note:
- a, b, and c in the same raw indicated a highly significant effect (P<0.01)
- p, q, r and s in the same raw indicated a significant effect (P<0.05)

Feed Consumption

Table 4 showed a significantly different effect of an increase in feed consumption as the level of turmeric extract increases with the highest feed consumption was for P3 (2071 ± 47 g/duck/28 days) but not significantly different with P2 and P4. The result may indicate stimulation in feed consumption due to inclusion of turmeric extract. Mide (2009) reported that curcumin in turmeric stimulate pancreas to produce more enzymes resulted a faster gastric emptying. Darwis *et al* (1991) said an increase in appetite is also resulted from improve metabolism of nutrient in the intestine.

Body Weight Gain

Table 4 showed that the highest body weight gain achieved for P4 and P3 indicated at higher level of turmeric extract addition correlate with high body weight gain, which is probably indicated a stimulation of nutrient metabolism leads to formation of more gain/meat. This might be partly explained by an improvement in intestinal microbial balance with preference to the growth of beneficial bacteria resulting in growth improvement. Andriyana (2008) also said that curcumin

stimulates secretion of growth hormones and then cell multiplication increase and has a correlation with growth of animal.

Feed Conversion

Table 4 showed that the lowest feed conversion was achieved by P4 indicated that the most efficient conversion of feed to be body weight gain was obtained if turmeric extract was orally dosed at 2.1ml/duck/day. Feed additive such as turmeric extract may improve the quality of feed, because the feed conversion is the lowest as mentioned by Djulardi(2006).

Income Over Feed Cost (IOFC)

Table 4 showed that the highest IOFC was achieved for P4 indicated that although increasing level of turmeric extract increase the price of feed is still beneficial for the farmers.

CONCLUSION

Based on the experiment it can be concluded that among the plant phytobiotic additive turmeric showed the strongest antimicrobial activity and, therefore, the use of 2.1 ml/duck/day is recommended to the farmer because it is still profitable.

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Diversity Gen Growth Hormone (Gh) of Kacang Goat In Kota Gorontalo and Regency Of Bone Bolango (Province Of Gorontalo)

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ABSTRACT

Growth Hormone (GH) is a hormone produced by cells in the anterior lobe of the pituitary somatrotop and formation process under the control of GH gene. One important function of this hormone is to help the process of tissue formation and metabolism of fat to meat forming. The purpose of this study was to determine the genetic diversity of genes GH Kacang goat in sub-populations of Kota Gorontalo and Regency of Bone Bolango. Blood samples were used for DNA extraction process in Centre of Biotechnology Laboratory University of Hasanuddin is 41 samples of Kacang goats with 21 samples from Kota Gorontalo city and 20 samples from Regency of Bone Bolango. Genomic DNA was extracted using a kit DNA extraction Genjet Genomic DNA Extraction (Thermo Scientific) following standard protocol phenol-chloroform, amplified by the technique of Polymerase Chain Reaction (PCR), and genotyping was done by Polymerase Chain Reaction-Restriction Fragment Length Polymorphism (PCR-RFLP) using the restriction enzyme Hae III. Data were analyzed descriptively by calculating the frequency of genotype, allele frequency, and degree of heterozygosity. The results showed GH genotype frequencies for the genotypes AA and AB were 2.45 and 97.5% respectively and the frequency of alleles A and B were 51.2 and 48.7% per cent respectively and the observed heterozygosity (Ho) and expected heterozygosity (He) were 0.97 and 0.50 respectively. Based on the sub-population genotype frequencies obtained GH gene of Kacang goat from Kota Gorontalo is 95.25 % for AA and 4.76% for AB, the frequency of allele A and B was 52.3% 47.6%, observated heterozygosity (Ho) 0.95 and expected heterozygosity (He) 0.51. GH gene genotype frequencies in Kacang goat from Regency of Bone Bolango is AB 100%, the frequency of allele A and allele B 0.5 0.5, observation heterozygosity (Ho) of 1.00 and expectation heterozygosity (He) 0.51. Based on the results concluded GH gene Kacang goat from Kota Gorontalo and Regency of Bone Bolango is polymorphic so that it can be used as the basis for the implementation of the selection.

Key Words: Genetic Diversity, Growth Hormone, Kacang Goat

INTRODUCTION

Kacang Goat as one of the local goat native to Indonesia which has advantages among others like able to adapt and survive on land with low quality forage conditions, resistance to local diseases is quite good, and the reproductive rate is high. Kacang Goat have smaller body size and body weight better than goats of Peranakan Etawah (PE) that is preferred by traditional farmers because they does not require high costs in the supply of feed during the production process. Along with population growth, the demand for meat in Indonesia is increasing as well so the goats are increasingly required not just for the main products (meat, milk, and feathers), but as one of the main requirements in various religious rituals such as animal sacrifices or the procession akiqah in Islam.

Existence of Kacang goat in some areas of Indonesia today is quite alarming and increasingly threatened by the onslaught of interbreeding with imported goat breeds. This is done with a desire

to accelerate the increase in productivity, but not accompanied by efforts to make the preservation of breed of Kacang goat as Animal Genetic Resources locally. Based on data from the Directorate General of Animal Science and Veterinary Republic of Indonesia (2013) up to the year 2013, the population of goats in Indonesia is 18.576.192 of which, 9.864.157 (56.42%) spread across the island of Java, 4.108.439 (23.59%) on the island of Sumatra, and 3.510.127 (19.99%) are scattered on other islands in Indonesia. Specifically in the provzince of Gorontalo, total population of goats owned 76.982 is dominated of Kacang goat and small portion of breed of Etawa goat and derived from crosses both.

Kacang goat as one of the germplasm and has been designated by the government as clumps of Kacang goat through a decree of the Minister of Agriculture No. 2840 / Kpts / LB.430 / 8/2012 need to be followed through purification, development, and sustainable use in the context of preservation. Research results of Ilham (2014) in the local goats in regency of Bone Bolango expressed that goats found in phenotype is Kacang goat, breed of Etawa goat and derived from crosses both.

The diversity of phenotypes are often in different levels with the level of genetic diversity (genes) of each goat. One gene that is often used to determine the genetic diversity in goats is genes Growth Hormone (GH). These genes function to control the process of formation of GH in the cell somatotrop the anterior lobe that plays a role in tissue growth and fat metabolism (Burton *et al*, 1994), increasing the efficiency of the use of feed, increasing the growth of organs and bone in animals growing (Etherton and Bauman, 1998), and setting the development of mammary glands in ruminants (Akers, 2006). Detection of genetic diversity has better accuracy than phenotypically because is not affected by the environment. Under these conditions, this study aims to determine the genetic diversity of genes GH Kacang goat in Kota Gorontalo and Bone Bolango Regency, Gorontalo Province.

MATERIAL AND METHODS

Blood Collection

Collection of blood samples obtained from goat of Kacang had 21 numbers from Kota Gorontalo and Bone Bolango Regency have 20 number so the total samples analyzed were 41. The determination is based on the region of origin of most populated goat of Kacang in each of the districts. Blood collected using vacumtainer tubes from the jugular vein (about 3 ml) using a needle and tubing vacuttainerberisi venojet EDTA. Blood from every region were subsequently collected and stored in a refrigerator temperature of 4 ° C prior to extraction of genomic DNA. The process of extracting and GH gene diversity analysis was carried out in the Laboratory of Integrated Biotechnology, Faculty of Animal Science, University of Hasanuddin.

Extraction of DNA

Blood DNA extraction procedure was based on standard phenol-chloroform method (Sambrook *et al*., 1989). DNA was isolated and purified using a DNA extraction kit Genjet Genomic DNA Extraction (Thermo Scientific) extraction by following the protocols provided. A total of 200 ml of blood samples were lysed by adding 400 ml of lysis buffer solution and 20 ml proteinase K (10 mg / ml) was then incubated at 56^{o}C for 60 minutes in water bath shaker. After incubation the solution was added 200 mL of 96% absolute ethanol and centrifuged at 6,000 xg for 1 minute. Purification of DNA was conducted using spin column by adding 500 µl wash solution wash buffer I, followed by centrifugation at 8000 × g for 1 minute. After the supernatants were discarded, the DNA re-washed with 500 mL wash buffer II and centrifuged at 12,000 xg for 3 minutees. Furthermore, the DNA was dissolved in 200 mL of elution buffer and disetrifugation at 8,000 x g. DNA extracted was collected and stored at -20 ° C. DNA quality testing conducted qualitatively by electrophoresis on a 1.5% agarose gel with 1x TBE buffer (89 mM Tris, 89 mM boric acid, 2 mM Na 2 EDTA) containing 100 ng / ml ethidium bromide and visualized on a UV transiluminator (gel documentation system).

Amplification of target DNA by the Polymerase Chain Reaction (PCR)

Composition of the PCR reaction was conditioned at 25 µl reaction volume consisting of 100 ng of DNA, 0:25 mM each primer, 150 uM dNTP, 2.5 mM Mg 2+, 0.5 and 1x Taq DNA polymerase buffer. Primers used for gene amplification GH consists of forward primer with the DNA sequence 5'-CTCTGCCTGCCCTGGACT-3'dan reverse primer with a DNA sequence 5'-GGAGAAGCAGAAGGCAACC-3' (Hua *et al*., 2009). Proses amplification preceded by initial denaturation at 94 ° C for 2 min, followed by the second stage has 35 cycles, each cycle consisting of denaturation at 94 ° C for 45 seconds, annealing (annealing) on temperature 65^{o}C for 30 seconds, and elongation (extension) of the cycle ending at a temperature of 72 ° C for 5 minutes. Process of amplification target of DNA using PCR machine (SensoQuest, Germany). Detection of the success of the amplification process is carried out by means of PCR products in electrophoresis on 1.5% agarose gel with 1x TBE buffer (89 mM Tris, 89 mM boric acid, 2 mM Na 2 EDTA) containing 100 ng / ml of ethidium bromide, and visualized on a UV transiluminator (gel documentation system).

Genotyping Gene Fragment GH

PCR products obtained from each of the target genes was analyzed by the method of Restriction Fragment Length polymorphisms (RFLP) through cuts GH gene using HaeIII restriction enzyme cutting sites which have GG | CC. A total of 4 µl DNA PCR products added 0.5 µl restriction enzyme (5U); 0.7 µl enzyme buffer; and 1 µl milique water to a volume of 7 µl further incubated for 17 h at 37 ° C. PCR-RFLP products later in electrophoresis on 2% agarose gel with 1x TBE buffer (89 mM Tris, 89 mM boric acid, 2 mM Na 2 EDTA) containing 100 ng/ml ethidium bromide. Then visualized on a UV transiluminator (gel documentation system). Allele is determined by interpreting the ribbon (band) formed the most distant migration of the anode (-) to the cathode (+) as the A allele, allele B next, and so on.

Data analysis

The data were then analyzed by calculating the value of each of the genotype frequency, allele frequency, the degree of heterozygosity, and hardy-Weinberg equilibrium by chi-square test with the formula Nei and Kumar (2000).

The formula used to calculate the frequency of genotype and allele frequencies among others:

$$X_{ii} = \frac{n_{ii}}{N} \text{ x } 100\%$$

$$X_i = \frac{(2n_{ii} + \sum_{j \neq i} n_{ij})}{2N}$$

Description:

Xii = Frequency Genotype
Xi = allele frequencies - i
Nii = number of samples ii genotype
Nij = number of samples ij genotype
n = number of samples

The formula used to calculate the value of the observation heterozygosity (Ho) and expectations of heterozygosity (He), among others:

$$H_o = \sum_{k}^{s} w_k \sum_{i \neq j}^{q} X_{kij}$$

$$H_e = 1 - \sum_{k}^{s} w_k \sum_{i}^{q} x_{ki}^2$$

Description :

Ho = heterozygosity observation among the population;
He = heterozygosity expectations among the population;
wk = the relative size of the population;
Xkij (i ≠ j) = frequency in the population to AiAj-k

RESULTS AND DISCUSSION

GH Gene Amplification

GH genes in Kacang goats were successfully amplified by PCR using a 1.5% agarose gel. Long GH which successfully amplified gene fragment in this study was 422 bp (Figure 1). This is similar to research conducted by Hua *et al* (2009) that the length of the GH gene amplification product by using the base pair primer was 422 base pairs (bp). Long fragment amplification product can be determined by matching the attachment site on the primer pair GH gene sequences (GenBank access number JN012229.1).

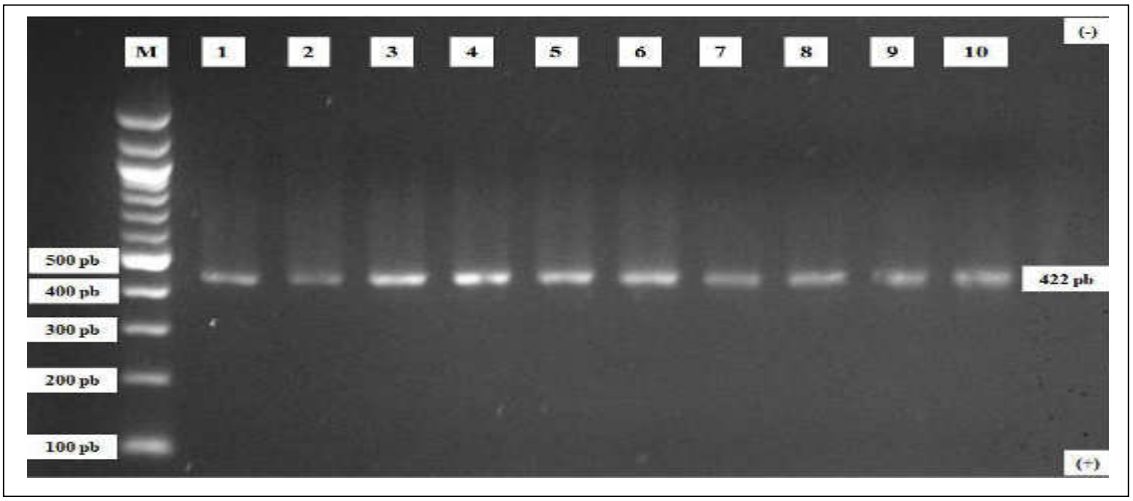

Figure 1. Growth Hormone Gene Amplification results Kacang Goat with PCR Technique

GH gene amplification is a process of propagation or multiplication component of GH gene DNA extracted using the aid of PCR. Temperature annealing in Kacang goats in this study is 65^{o}C for 30 seconds. This condition is different from the temperature annealing in goats of Peranakan Etawah (PE), Saanen, and Peranakan Etawah-Saanen (PESA) which is 60^{o} C for 45 seconds (Yuniarsih *et al*, 2011), in cattle Bali temperature of 60ºC (Sumantri *et al*, 2011), but similar to the results of research on Kacang goat in Jeneponto (Yuliyanty, 2013). Several factors can affect the success rate of amplification in livestock among other interaction components of the mixture of PCR (Palumbi, 1996), the temperature annealing (Yuniarsih *et al*., 2011), the purity of the extraction, the accuracy of the primaries used is the content of G / C is 50%, as well as the accuracy of PCR conditions (Rahayu *et al*., 2006).

The diversity of genes GH / HaeIII with RFLP

Genetic diversity can be calculated using several measuring devices including genotype frequency, allele frequency, and degree of heterozygosity. Genotype frequency is the proportion of individuals of each genotype, gene frequency involves the identification of alleles at each locus were analyzed and the calculation of the proportion of different types of alleles (Zein *et al*, 2012). Allele frequency is relatively from allele frequency in the population or the number of total alleles contained in the population (Nei and Kumar, 2000) The value of heterozygosity is the most appropriate way to measure the genetic diversity of a population (Nei, 1987).

The frequency of genotype and allele frequencies

Based on the results of the analysis of genotype frequency in the DNA fragment GH genes in Kacang goats of the 41 samples the results of two kinds of genotypes AA and AB was obtained while genotype B was not found (Table 1). AB genotype frequency (97.5%) was higher than the AA genotype frequency (4.76%). AB genotypes in this study is characterized by the formation of three

fragments with a length of each 422 bp, 366 bp, and 56 bp fragment while AA 2 fragment with a length of 366 bp and 56 bp (Figure 2). This result does not vary much with the results Yuliyanty (2013) in Kacang goats that received genotypes AB (0.723) high, while the AA genotype (0.276) The results of the other studies obtained frequency of Boer goat genotype AB (0.837) higher than the AA genotype (0.162) but not found BB genotype (Hua *et al.*, 2009).

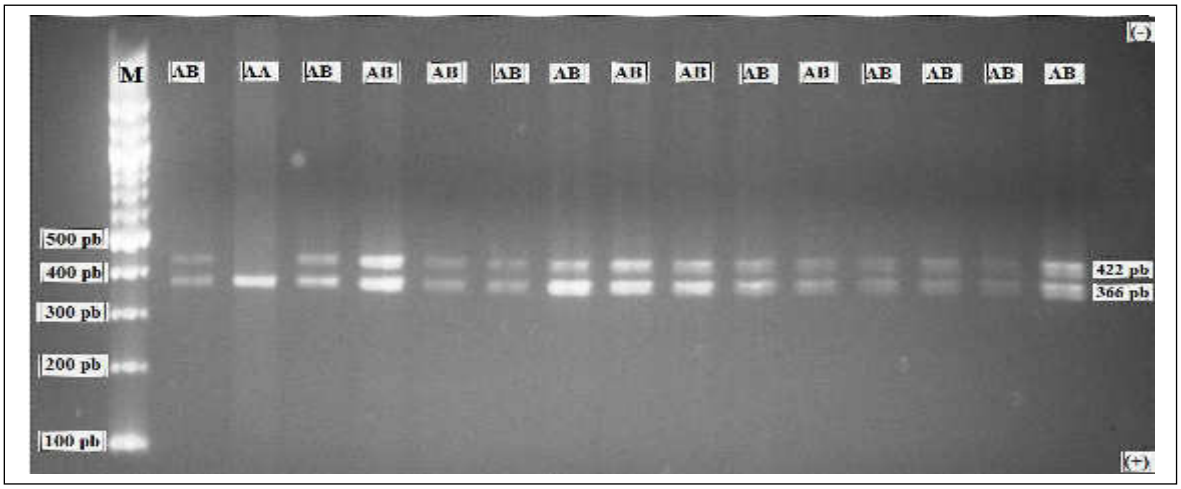

Figure 2. Visualization of PCR-RFLP gene segments GH|HaeIII goat beans in Gorontalo city and Bone Regency Bolango

Results of analysis of gene segments GH|HaeIII Kacang goat on both sub-populations indicated that the A allele frequency was 0.512 higher than the frequencies of alleles B 0.487. A allele frequencies were higher due to the discovery of genotype AA in the sub-population of the Kota Gorontalo though only one tail so that the effect on the results of the A allele frequency calculation higher than allele frequencies of alleles obtained B. is not much different from the results Yuliyanti (2013) who discovered the A allele frequency was 0.638 and the B allele was 0.36. Allele frequency values of both A and B lower than 0.95 indicates a polymorphic gene GH|HaeIII in Kota Gorontalo and Regency of Bone Bolango. Nei (1987) says that an allele is said to be polymorphic allele if it has a frequency equal to or less than 0.99. Nei and Kumar (2000) stated that the genetic diversity occurs when there are two or more alleles in a population (typically more than 1%).

The degree of heterozygosity and Hardy-Weinberg Equilibrium

Based on the analysis, the value of observation heterozygosity (Ho) was 0.97 and expectation value of heterozygosity (He) is 0.50 (Table 1). Heterozygosity value is slightly different from the results of Yuliyanti (2013) in Kacang goats in Jeneponto stating He Ho amounted to 0.533 and 0.461. Heterozygosity values influenced the amount by the number of samples, the number of alleles and allele frequencies. According to Tambasco *et al* (2003), the difference between the value of the observation heterozygosity (Ho) and the expectation value of heterozygosity (He) may be an indicator of lack of balance genotypes in the population observed. Nei (1987) stated that the value of heterozygosity ranged between 0 (zero) to 1 (one), if the value of heterozygosity equal to 0, then among the population measured have a genetic relationship is very close and if the value of heterozygosity equal to 1 then among the population as measured there genetic or genetic linkage relationships altogether. Observation heterozygosity values is higher than the expectations of heterozygosity indicates a relatively high genetic diversity in the population of Kacang goats in Kota Gorontalo and Regency of Bone Bolango District. Some factors that may affect the high level of diversity is the mating of females to males who are not pure breeds of Kacang goat.

Table 1. Frequency of genotypes, allele frequencies and heterozygosity Value Kacang Goat in Kota Gorontalo and Regency of Bone Bolango, Gorontalo Province

Region	n (goat)	Genotype	Frequency Genotype	Allele Frequency		Heterozygosity		X^2
				A	B	Ho	He	
Kota Gorontalo	21	AA	1 (0,047)	0,523	0,476	0,95	0,51	16,4
		AB	20 (0,952)					
		BB	0					
Bone Bolango	20	AA	0	0,50	0,50	1.00	0,51	19,0
		AB	20 (1,00)					
		BB	0					
Kota Gorontalo and Bone Bolango	41	AA	1 (0,024)	0,512	0,487	0,97	0,50	36,23
		AB	40 (0,975)					
		BB	0					

Description: degrees of freedom (db) = 1; X 20.05 = 3.84 and = 6.64

Balance X20,01 alleles within a population (Hardy-Weinberg equilibrium) be based on the value of chi squared (X2) are calculated based on differences in genotype frequency of observations with genotype frequencies expectations (Misrianti *et al* , 2011). Based on the analysis of gene GH|HaeIII chi squared on the results obtained in the two sub-populations of Kacang goats in Kota Gorontalo and Bone Bolango in an unbalanced state (X2 count 36.3> X2 Table 3.84) of provisions expected by Hardy-Weinberg law. This imbalance indicates that there has been a relationship that is not random in both subpopulations are caused by several factors. Hardy Weinberg equilibrium is closely related to the frequency of genotype and allele frequencies. Based on Hardy-Weinberg law that dominant and recessive gene frequencies in a population large enough will not change from generation to generation if there is no selection, migration, mutation, genetic drift (Hardjosubroto, 1998). The results of research conducted by Ilham (2014) declared a local goat in Bone Bolango phenotypically characterized qualitatively like those of Kacang and Peranakan Etawa goats beans(?genes). Introductions Peranakan Etawah (PE) goat in the past in order to improve the genetic quality of Kacang goat in Gorontalo bit much has altered the genetic composition of Kacang goat in Kota Gorontalo and Bone Bolango Regency. Artificial selection that is not directed has caused the Kacang and PE goats with a pattern that is not directed also to produce offspring goat-PE composite but without clear genetic composition percentage causing an imbalance of Hardy-Weinberg.

CONCLUSION

Based on the results of the study concluded GH gene genotype frequencies of the whole sub-populations observed was AA and AB 2.45% and 97.5%, the frequency of allele A and allele B 51.2% and 48.7%, observations heterozygosity (Ho) 0, 97 and hope heterozygosity (He) 0.50. Kacang goat population in Kota Gorontalo and Bone Bolango Regency in an unbalanced condition and are polymorphic so that it can be used as the basis for selection in order to improve the quality of genetic relationship.

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Morfometric Portrait of Swamp Buffalo in Bombana

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ABSTRACT

The aim of this study was to find a portrait of body weight and body size of swamp buffalo in mainland and islands of Bombana region. The parameters observed were: body weight, shoulder and hip height, body length, chest circumference and width of hips. Based on the results of the study concluded: (1) the average body weight of buffalo in the islands was 416.9±117 kg, significantly higher ($P<0.05$) compared with the mainland area which averaged only 377.3±100 kg, as well as the average hips width of swamp buffalo in island area was significantly higher ($P<0.05$) than in the mainland, (2) portrait of body measurement of swamp buffalo generally not significantly different ($P> 0.05$) between the mainland and island regions, except the size of the hips width in the island was significantly higher ($P<0.05$) than the mainland, (3) the main component identifier of the total diversity of buffalo body measurements in mainland area was body length (69.30%), while the island areas was chest circumference (73.50%).

Key Words: Buffalo, Body Weight, Body Measurement, Principal Component Analysis

INTRODUCTION

The ability of domestic meat production has not been able to meet the needs of meat for the national community recently. As a result, the government must import frozen meat and calves from abroad. Based on the BPS report (2014) cited by detik Finance (2015) informed that imported meat during last few years has increased. Imports of frozen meat and calves in 2008 amounted to 91.6 thousand tons with a value of $ 198.8 million US, in 2009 reached 110.2 thousand tons with a value of $ 266.6 million US, and in 2010 jumped to 140 thousand tons with value reached $ 395 million. Although since 2011 the volume of imports tends to be reduced, but the value of these imports are still high, which in 2011 amounted to US$ 321.4 million and 2012 reached US$ 156.1 million. Imports of beef cattle in 2014 as many as 760,000 head (consist of 3,794 head of cattle seed and cattle ready for slaughter as many as 693,756 head or the equivalent of 115.510 tons meat. Total imports of beef meat in 2014 were 200,794 tons (or 26.52 % of total demand).

The Government through the Ministry of Agriculture continues to strive to reduce or even stop the dependence on imported the meat through improving meat production capacity in the country, by launched a program "Indonesia Self-sufficiency in meat premises in 2014". Buffalo is one commodity that is expected to play an important role in supporting the achievement of self-sufficiency in meat. The Performance of buffalo production which is not much different from beef cattle and its existence that has been fused with the social, economic and cultural community is the reason why the buffaloes play an important role in improving the national meat production.

However, statistical data livestock last few years indicated a population fluctuations buffaloes in Indonesia. The population of buffaloes nationally in 2008 was 1,930,716 head, in 2009 was 1,932,927 head, and in 2010 was 1,999,604 head. In Year 2010 was the peak population of buffaloes in Indonesia, due in 2011 dropped dramatically to 1,305,078 head, and in 2012 as many as 1,378,153 head, with an average reduction of 7.2% per year (Direktortat General of Livestock and Animal Health, 2013).

Reduction of Buffaloes population also occurred in the Southeast Sulawesi. In 2008 the population of buffalo in the region totaled 7,078 in the tail, but in 2012 dropped to 2,677 head or an

average reduction of 15.5% per year (Directorate General of Livestock and Animal Health, 2013). While on the other hand, in rural buffaloes contribute a lot, both as a source of revenue and labor to cultivate agricultural land (Prawirodigdo and Utomo, 2010), as well as the savings that can be sold at any time to meet the needs of families.

Bombana is an area that has the largest buffalo populations in the Southeast Sulawesi. In 2011 the population numbered 709 head or covering 34.8% of the total population of 2,610 head of buffalo in the Southeast Sulawesi (Southeast Sulawesi BPS, 2012). Compared to 2010, the population of buffalo in this region experienced a decline of as much as 765 tails or 51.9% of the population in 2010 (BPS Bombana, 2013).

As a development area of buffalo, Bombana has specific characteristics. Development of buffaloes in the mainland area is in Poleang, especially in the District of South Poleang and Central Poleang. This area is located on a dry land savanna, but in which there are some spots that serve as the swamp buffaloes wallowing area. Bombana also has Kabaena Island which is one of the regions of buffalo development in this region. In 2010 buffalo in this region amounted to 225 individuals (Bombana BPS, 2011). The specific characteristics of Bombana region may be associated with the morphometric variability buffaloes in this region.

Morphometric character of buffaloes is basic information that is important and necessary not only in order to develop but also to preserve and maintain the genetic diversity of this animal. In addition, analysis of the total diversity of the primary identifier morphometric help rejuvenate fix all the characters, based on the character of the most widely drawing morphometric variability buffalo. The aim of this study was to record the variability of morphometric characteristics, and analyzed the main character identifier of buffaloes morphometric variability in the mainland and islands of Bombana region.

MATERIAL AND METHOD

This study was conducted in Bombana, which includes four districts, that is: 2 districts represent the land area (Poleang subdistrict South and Central Poleang) and 2 districts represent of the islands (Central Kabaena and North Kabaena). The location was determined by purposive research, ie the one that has the highest buffalo population in each region (mainland and islands of Bombana). Equipment used include: (1) digital scales for weighing the buffalo body weight, (2) a measuring stick to measure the height of the shoulder, hip height, hip width, and (3) measuring tape to measure the circumference of the chest and body length.

Observed Variables

Variables measured and how to measure the dimensions of the body to record the character's body size dimensions are as follows:

1. High shoulder (TP), the highest distance behind the shoulder through the scapula perpendicular to the ground was measured using a measuring stick, units in cm.
2. Chest Circumference (LID), measured just behind the scapula circular, using the measuring tape, the unit is in cm.
3. The length of the body (PB), straight-line distance from the edge of the spinous processus bone to bone bump layers (Os ischium), measured using a measuring stick, the unit cm.
4. High hip (TPI), the highest distance hips are perpendicular to the ground, measured using a measuring stick, units in cm.
5. Hip width (LPi), the distance between the hip joint widths, measured using a measuring tape, units in cm.

Data analysis

Morphometric character data such as body dimensions sizes are grouped by age and region development. Furthermore, the data were analyzed to obtain the mean, standard deviation, and

coefficient of variability based Walpole (1982), ie:

$$\overline{X} = \frac{\sum_{i=1}^{n} Xi}{n} \qquad s = \sqrt{\frac{\sum_{n-1}^{n} (Xi - \overline{X})^2}{n-1}} \qquad KK = \frac{s}{\overline{X}} \times 100\%$$

Remarks: $\bar{X}$ = mean of sample in group to-1
s = Standard deviation
$\bar{X}_i$ = volue to-i of x variable
n = number samples
CC = Variation Coeficient

To compare the inter-regional group of buffalo t-test is done by using the formula Walpole (1982) as follows:

$$t_h = \frac{(\overline{X}_1 - \overline{X}_2)}{\sqrt{\frac{\sum (X_{1_j} - \overline{X_1})^2}{n_1(n_1-1)} + \frac{\sum (X_{2_j} - \overline{X_{21}})^2}{n_2(n_2-2)}}}$$

Remarks: t_h = value of t
$\bar{X}_1$ = mean of sample in group to-1
$\bar{X}_2$ = mean of sample in group to-2
$\bar{X}_{1j}$= observation value to-j in first group
$\bar{X}_{2j}$ = observation value to-j in second group
n_1 = number of samples in group to-1
n_2 = number of samples in group to-2

Discriminant analysis performed in the variable: shoulder hight (TP), hip height (TPI), hip width (Lpi), body length (PB), and chest circumference (LingD). Furthermore, to provide discrimination to the body size and shape, will be Principal Component Analysis (PCA). PCA used to get the size and shape equations derived from the covariance matrix, with the model equations:
$Yp = a_{1p}X_1+a_{2p}X_2+....+a_{pp}X_p$

Remarks: Yp = principal components to-p
a_{1p} - a_{pp} = *Eigen*vector to-p, (p = 1,2,3, ...,n)
X_p = variable to-p, (p = 1,2,3…..n)

RESULTS AND DISCUSSION

The mean and standard deviation of body weight, body length, shoulder height, chest circumference, hip height and chest width according to age, sex and area of research can be seen in Table 1.

Body Weight

Quantitative trait that has important economic value in buffaloes is body weight, so it is always used as the main criterion in the selection. Portrait buffalo body weight according to age and sex on the mainland and island of Bombana region can be seen in Table 1 and Figure 1. Mean body weight of the buffalo of the islands was 421.9±117 ($P < 0.05$) higher than the land area which averaged only 377.3±100 kg, with a coefficient of variability respectively were 27.77% for the land area (Poleang) and 26.54% for buffalo in Kabaena Island. While the male buffalo body weight was

generally lower than females, although not statistically significantly different (P> 0.05). Overall mean body weight of male buffalo in this experiment was 406.3 ± 96.9 kg and female was 391.9 ± 123.7 kg.

Table 1. Mean and standard deviation of body weight and body size dimensions of buffalo by age, gender and regional research in Bombana

Age	**Sex**	**Place**	**Body Weight (kg)**	**Body length (cm)**	Shoulder Height **(cm)**	Hip Height **(cm)**	Circum-ference **(cm)**	chest width **(cm)**
< 2	♂	Poleang	237±80	117±70	109±1	105±6	146±10	35±7
		Kabaena	257±36	132±17	112±9	109±8	145±27	37±7
	♀	Poleang	180±105	114 ±21	104±14	104±12	131±30	27.0±5
		Kabaena	226±55	121±5	107±11	108±11	140±8	33±11
	♂+ ♀	Poleang	191±97	121±44	107±14	105±15	145±35	28±6
		Kabaena	249±42	115±15	108±9	109±8	141±28	35±8
2 – 3	♂	Poleang	323±28	125±18	113±4	109±27	170±24	41±7
		Kabaena	335±80	140±18	119±6	114±10	180±23	43±03
	♀	Poleang	341±73	117±15	108±6	117±70	174±22	37±1
		Kabaena	344±91	130±21	112±13	119±12	180±19	46±8
	♂+ ♀	Poleang	354±62	126±20	101±5	117±18	176±23	39±7
		Kabaena	434±87	132±21	116±12	117±12	176±20	45±9
4 – 5	♂	Poleang	414±45	131±19	120±4	120±24	183±16	41±8
		Kabaena	473±66	144±21	129±8	126±10	194±28	47±3
	♀	Poleang	403±43	130±19	120±4	121±12	179±10	39± 4
		Kabaena	467±121	134±21	129±13	128±11	198±34	45±10
	♂+ ♀	Poleang	443±42	134±19	120±11	120±15	197±10	39±05
		Kabaena	450±103	132±21	128±11	129±11	181±31	46±6
> 5	♂	Poleang	470±29	156±23	128±5	126±6	202±9	46±4
		Kabaena	504±35	165±5	130±6	128±6	210±8	53±9
	♀	Poleang	445±39	145±10	128±3	126±4	188±12	44±5
		Kabaena	495±34	160±13	129±6	131±7	207±9	50±8
	♂+ ♀	Poleang	457±36	161±13	128±4	126.6	195±13	39±4
		Kabaena	501±34	156±12	131±6	130.6	208±9	54±8
Total	♂	Poleang	389±68	135±32	123±6	122±23	190±21	40±6
		Kabaena	424±121	149±22	117±10	116±11	176±31	44±9
	♀	Poleang	365±111	130±21	120±10	121±12	178±27	36±7
		Kabaena	418±110	142±21	125±12	124±12	187±29	48±10
	♂+ ♀	Poleang	377±100	133±31	121±9	121±16	182±25	38±9
		Kabaena	416±117	145±22	122±12	121±12	183±30	47±10

Remarks: Data processed

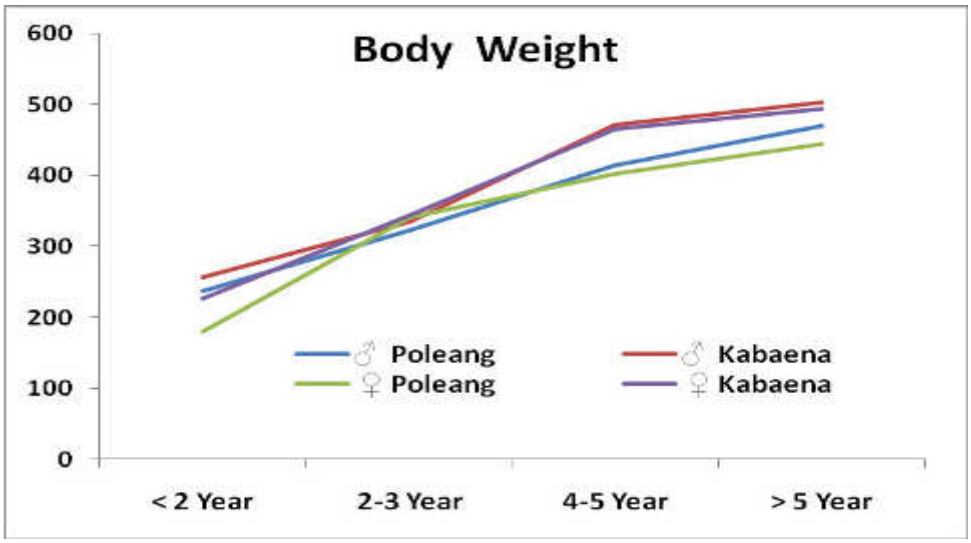


Figure 1. Buffalo body weight by different age and sex in the mainland and island of Bombana.

Based on the information breeders in this region of high male buffalo weighing generally preferred buyers and they are willing to pay a high price. The higher body weight and better body condition male buffalo, the higher of resale value. As a result, male animals with high performance will sold quickly, while having less performance maintained and produce offspring.

The high sales figures in the male buffalo Bombana supposed to influence the decrease in the average weight of the male animals. Male buffalo experiencing negative selection, thereby decreasing the genetic quality. Robbani et al. (2010) reported a similar situation in the swamp buffalo in Bogor Regency, and concluded that in general female buffalo in District Cibungbulang, Pamijahan, Nanggung and Sukajaya have a greater tendency than male buffalo.

Buffalo body weight over 2 years of age in this study (421±42 kg for males and 405±103 for females) was relatively not much different from Chantalakhana and Skunmum (2002) that buffalo swamp adults aged 4-5 years on average is 450 to 650 kg for male buffalo and 350 to 450 kg for female buffalo, the adult age range from 4 to 5 years. Similarly, when compared with the buffalo in Thailand that have adult body weight 350 to 650 kg (Chantalakhana and Skunmum, 2002), it was not much different from buffalo in Bombana, even has a higher weight than the swamp buffalo in China ie 250 kg, and Mianmar about 300 kg (Shackleton and Harestad, 2003).

Body Length

Research in the field of livestock breeding, especially in characterizing ruminants always include body length to the quantitative trait group. These characters include the traits of high economic value. Portrait of buffalo body length based on age and sex in Bombana mainland and island regions can be seen in Table 1 and Figure 2.

Male buffalo has body length which is relatively higher than females, especially after the age of adulthood, although it was not statistically significantly different (P> 0.05). Under 2 years of age, female buffalo in Poleang has average body length 113±70 cm and 132±17 cm at Kabaena, while female was 114±21cm in Poleang and 121±51 cm in Kabaena Island. At the age of 2-3 years of age, male buffalo has a body length 125±18 cm in Poleang and 140±18 cm in Kabaena, whereas females 117±15 cm in Poleang and 130±21 cm in Kabaena. In 4-5 years of age, male buffalo has a body length 131±19 cm in Poleang and 144±21cm in Kabaena, whereas females 130±19 cm in Poleang and 134±21 cm in Kabaena, buffalo aged over 5 years have a body length in males, 156±23 cm in Poleang and 165±5 cm in Kabaena, whereas females 145±10 cm in Poleang and 160±13 cm in Kabaena. In general, male buffalo has body length 144.61±31.14 cm with Variance Coefficient (VC) is 21.72%, longer than the female buffalo that only 130.45±23.37 cm with VC is 17.91%.

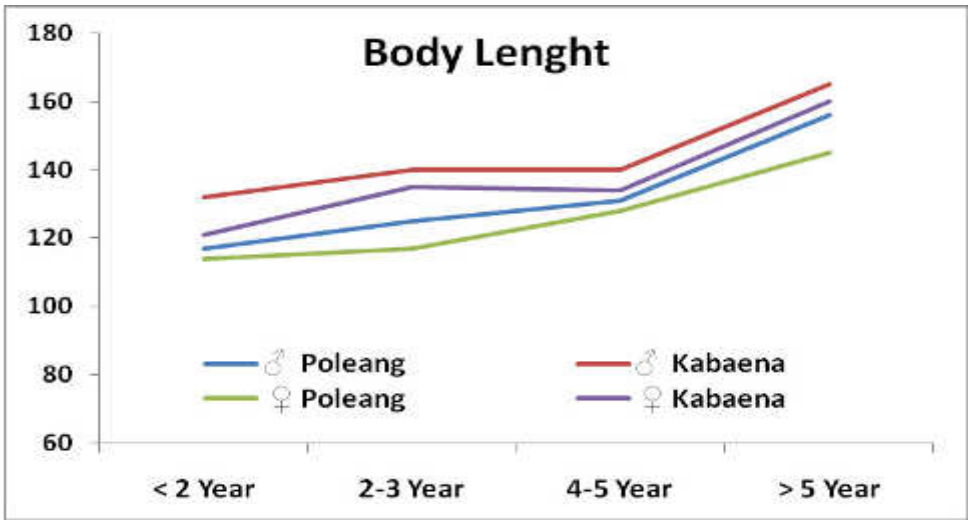


Figure 2. Buffalo body length by different age and sex in the mainland and island of Bombana.

In general, buffalo in mainland has body length 133.15±31.01 cm with VC 23.29%, shorter than in Kabaena islands that is 137.51±21.97 cm by VC 15.98%, but statistically not significantly different (P> 0, 05). Body length of Bombana swamp buffalo in this study was 134.00±27.39 cm, higher than the adult swamp buffalo in Bogor Regency, which is between 121.90 to 130.3 cm (Robbani et al., 2010), local buffalo in Brebes, ie 106.00±13.07 cm (Muhammad and Kusumaningrum, 2006), and the swamp buffalo of Sumbawa that has a mean value and standard deviation of 103.6±6.1 cm (Anggraeni and Triwulanningsih, 2007).

Shoulders High and Hips High

High shoulder and hip height is a measure of body dimensions that frequently used as selection criteria in large livestock such as beef cattle and buffalo. Together with other body dimensions sizes (chest circumference and body length), both parameters can be used to predict body weight, especially in rural areas that do not allow direct weighing. Livestock body dimensions are very important to know because it directly weighing often not possible because the animal/livestock scales are not available (Siregar et al., 1996).

Shoulders Hight

According to Santosa (1983), data chest circumference, body length and shoulder height can be used to estimate the live weight of the buffalo. The mean and standard deviation of buffalo shoulder height according to age and sex on the mainland and islands Bombana Region can be seen in Table 1, while the body length portrait of a buffalo by sex, age and Bombana Region development of buffalo can be seen in Figure 3.

Mean and standard deviation of the shoulder height of Bombana buffalo was 121±10 cm. Buffalo in mainland and the islands have relatively high at the shoulder that is 121±9 and 122±12 cm. By sex, male buffalo relatively has higher shoulder than females, ie 122±11 cm for males with VC is 7.40% and 120±9 cm in females with VC is 9.42%.

The mean hip height of Bombana swamp buffalo relatively similar to the height of swamp buffalo in Bogor, which is between 113-126 cm (Robbani et al., 2010), and tend to be higher than the swamp buffalo in Bradford as reported by Muhammad and Kusumaningrum (2006) with an average of shoulder height were 113.2±28.20 cm. The results of this study also relatively similar to the result reported by Triwulanningsih et al. (2004) that the average height of adult buffalo shoulder in West Java is 122 cm and 123 cm from Central Java, and Banten Province is 120 cm. However, the results of this study is lower than the results of research Chantalakhana (1981) that found that adult swamp buffalo in Indonesia have an average height of 127-130 cm for males and 124-125 cm buffalo buffalo females. However, body height and shoulder height buffalo Bombana lower compared with

salvation Borneo swamp buffalo, ie male is 135 cm and 130 cm in females, and also lower than the swamp buffalo Banten province to the male sex in 3 districts ie Serang samples 129.67 cm, 129.79 cm Pandeglang and Lebak regency 130.59 cm (Dude et al., 2011). Furthermore, it is stated that the female shoulder height row is 118.88 cm; 119.20 cm and 118.90 cm.

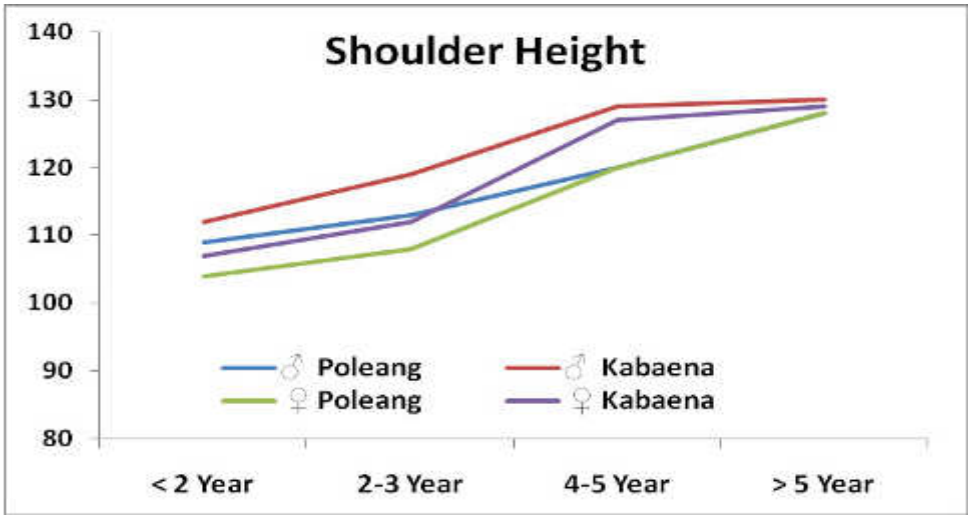


Figure 3. Buffalo shoulder height by different age and sex in the mainland and island of Bombana region.

Hips Height

Portrait of buffalo hip height based on age and sex on the mainland and island regions Bombana can be seen in Table 1 and Figure 4.

Increasing age was followed by an increase in the size of cattle hip height, especially before adulthood. At the age of less than 2 years, the average hip height in Bombana buffaloes was 109±15 cm for males with VC is 13.89% and 108±8 cm for females with variability coefficient is 7.33%. Age 2-3 years increased to 117±18 cm for males with VC is 15.38% and 117±12 cm for females with VC is 10.26%. Age 3-4 years have hip height 125±15 cm for males with VC 12.00% and 120±11 cm for females with variability coefficient 9.17%. While the above 5 years of age, respectively 126 ± 6 cm for males with variability coefficient 4.76% and 130 ± 6 cm for females with VC is 4.62%. Buffalo males tend to have size hips average height 122 cm with VC is 15,37% higher than females 118 cm with VC is 9.85%.

Buffaloes in Bombana mainland area have relatively high hip which is equal to the islands (Kabaena Island), those are 120.9±16.42 cm with VC is 13.58% and 120.98±12.03 cm with a coefficient of variability is 9.94%. When compared with the hip high swamp buffalo in South Tapanuli which range from 119.07-135.82 cm for males to 117.42-135.82 cm for males (Kampas, 2008), then both are relatively not much different, except with that buffalo is on site Sibuhuan (135.82 cm), the results of this study were lower. However Bombana buffalo shoulder height is slightly lower than the swamp buffalo in North Sumatra, ie 125.56 cm (Sitorus, 2008), and swamp buffalo Dompu in West Nusa Tenggara, i.e. an average of 123.03 cm (Erdiansyah, 2008).

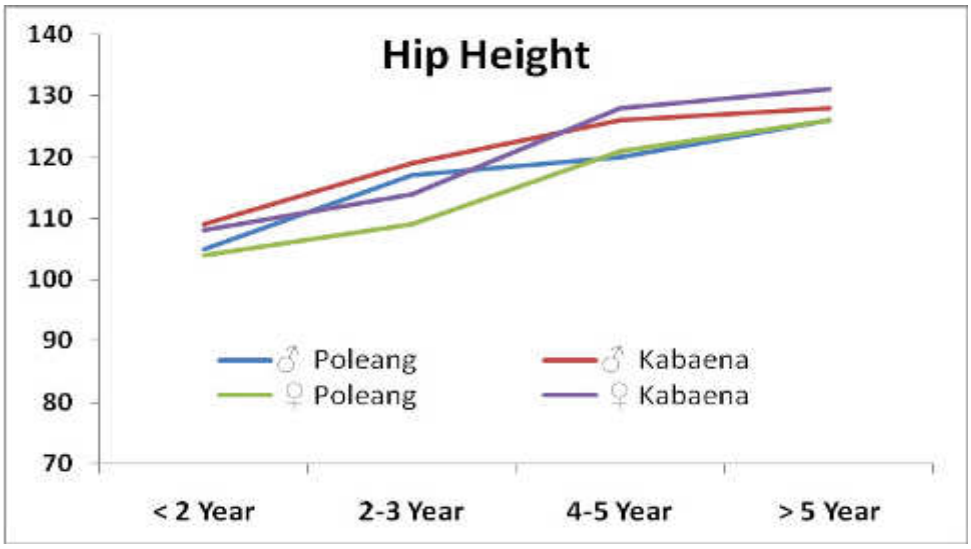


Figure 4. Buffalo Hip height by different age and sex in the mainland and island Bombana.

Chest Circumference

In most ruminants, chest circumference size is the best method to predict the body weight, so it is often used as one of the selection criteria. Anggraeni and Triwulanningsih (2007) found that chest circumference is a predictor of body weight on buffalo Sumbawa highest determination coefficient of 68.7% and the regression equation is Body Weight = -390 + 4.112 chest circumference. Portrait buffalo chest circumference based on age and sex on the mainland and island of Bombana region presented in Table 1 and Figure 5.

The average chest circumference of swamp buffalo Bombana was 183±28 cm with a coefficient of variability of 15.30%. Buffalo chest circumference at the Kabaena islands was 183 ± 30 cm that likely to be higher than in Poleang that only 182 ± 25 cm. In addition, seen of sex, male buffalo have an average chest circumference of 183±27 cm with VC was 14.66%, higher compared with females only 182±28 cm with VC was 15.51%, but a statistically significant difference in the development region and sex were not significantly affected (P> 0.05) to swamp buffalo chest circumference (Table 1).

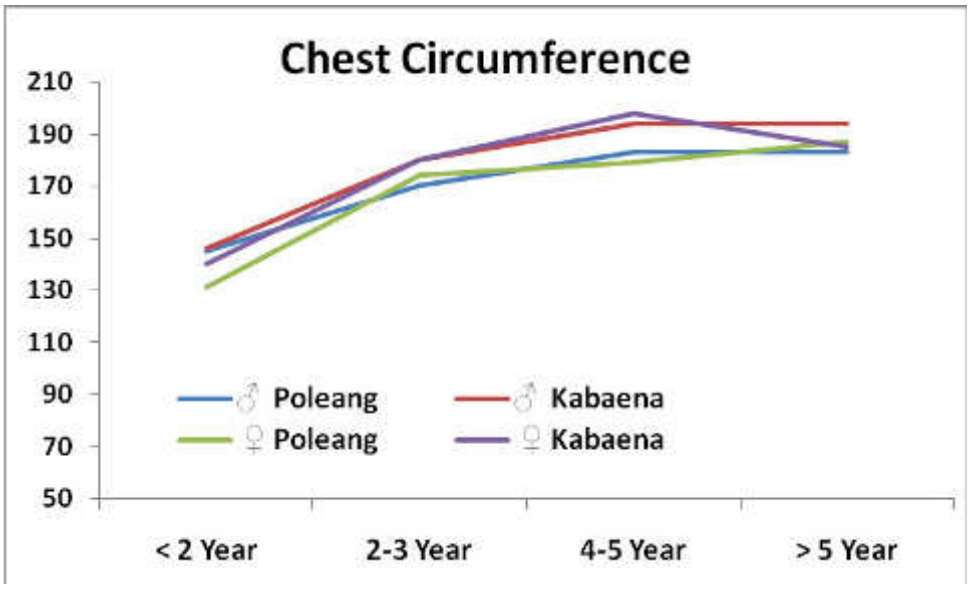


Figure 5. Buffalo chest circumference by different age and sex in the mainland and islands Bombana

Buffalo chest circumference at Bombana was increase with increasing of age. Buffalo over 2 years of age has the average chest circumference that is 182.89±26.82 cm for males with VC is 14.66% and 182.33±28.28 cm for famales with VC is 15.51%. The results obtained in this study was higher than the swamp buffalo Brebes reported by Anggraeni and Triwulanningsih (2007) ie only 171.7±8.8 cm, and male swamp buffalo in Banten Province ie 172.81±5.36 cm to Serang, 170.31±4.47 cm to Pandegrlang and 172.81±5.36 cm for the district of Lebak (Dudi et al., 2011).

Hips Width

Growing age the greater the size in width hips. The mean width of the hips of Bombana swamp buffalo was 37.65±6.86 cm for the mainland (Poleang) were significantly (P<0.05) lower than the buffalo in Kabaena island 47.10±10.00 cm. Age increasing age was followed by increasing in size of buffalo hip width (Figure 6).

The mean of width hips on Bombana swamp buffalo obtained in this study was 42.10±9.69 cm, which is higher than the swamp buffalo in South Tapanuli that only about 27.16 to 33.13 cm in males and from 26.84 to 33.13 cm in females (Rampas, 2008). Similarly, when compared with the results of the research by Erdiansyah (2008) on swamp buffalo in Dompu West Nusa Tenggara that is 35.86 cm, but lower than the results of the research Sitorus (2008) on swamp buffalo in North Sumatra with an average width of hips is 48.59 cm.

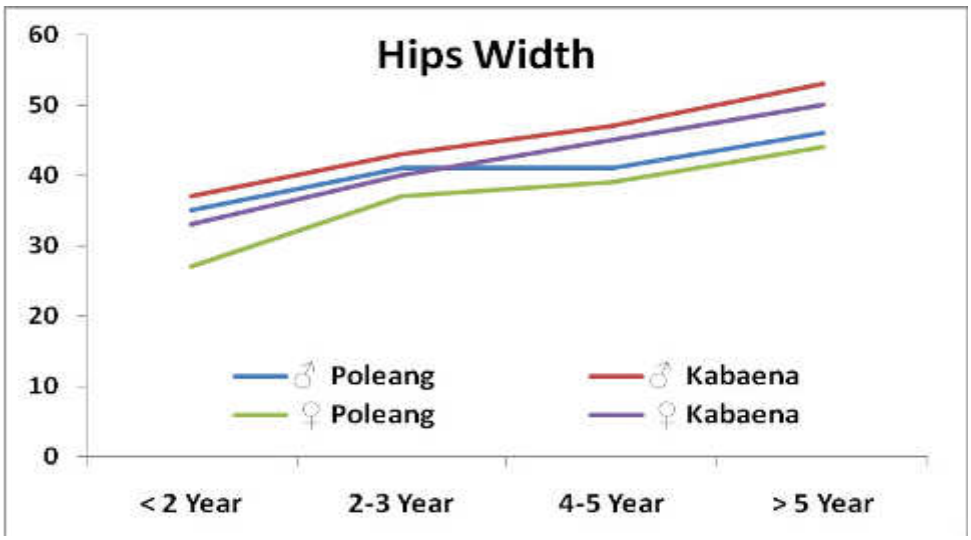


Figure 6. Buffalo Width Hips by different age and sex in the mainland and island Bombana

Principal Component Analysis

Principal Component Analysis (PCA) is used as a determinant of discrimination between cattle populations. In morphometric application of PCA, Principal Component I is an eigenvector size, while the second main component is an eigenvector form (Pangestu and Mulyono 1996). Body size variable that has the highest value in the equation Eigenvector body size variable identifier used as body size, body size as well as variables that have the highest Eigen vector values in equation form used as variable identifier body shape.

CA results in the form of equation size and shape of the body, the total diversity (KT), and Eigen value (λ) buffalo (mixed sex) in the mainland and islands Bombana presented in Table 2.

Body Size

Results of principal component analysis (Table 2) showed that the value of the highest Eigenvector in equation buffalo body size in Bombana mainland area present in body length (0,768X4). While the value of the highest eigenvectors in equation of buffalo body size in Bombana island areas found on the circumference of the chest (0,739X3).

Table 2. Equation body size and shape, and the total diversity Eigen values of buffalo (mixed sex) in the mainland and islands of Bombana

Place	PC	Equation	TV (%)	Λ
Mainland Area	Body size	$0,182X_1 + 0,045X_2 + 0,554X_3 + \mathbf{0,768X_4} + 0,212X_5 + 0,095X_6 + 0,102X_7 + 0,057X_8$	69,30	1.380,60
	Body shape	$0,161X_1 + 0,078X_2 + \mathbf{0,686X_3} - 0,632X_4 + 0,307X_5 + 0,041X_6 + 0,042X_7 - 0,001X_8$	16,10	320,10
Kabaena Island	Body size	$0,257X_1 + 0,197X_2 + \mathbf{0,739X_3} + 0,462X_4 + 0,251X_5 + 0,210X_6 + 0,165X_7 + 0,036X_8$	73,50	1.532,30
	Body shape	$-0,167X_1 + 0,166X_2 + 0,236X_3 - 0,544X_4 - 0,219X_5 + 0,091X_6 + \mathbf{0,730X_7} + 0,059X_8$	12,70	264,80

Remarks*:* PC= Principal Component, TV = Total Variability, X_1 = Shoulders height, X_2 = chest width, X_3 = chest circumference, X_4 = body length, X_5 = Hip height, X_6 = Hop width, X_7 = Head lenght, X_8 = head height.

Based on the highest Eigen vectors value on equality body size, then the variable identifier buffalo body size in Bombana mainland area was body length (X4), while the variable identifier buffalo body size in Bombana island areas was chest circumference (X3). The existence of differences in body size identifier in both populations indicate that these buffalo that living and growing in the land area was genetically different from the buffalo in Bombana island areas. Such differences may also be influenced by differences in environmental conditions. Tzeng et al. (2000) stated that the presence of morphometric variation of a population at different geographical conditions may be caused by differences in the structure of genetic and environmental conditions.

Identifier the size of the body of a buffalo in the mainland and in the islands of Bombana region contrast to Sembiring et al. (2013) report which states that the identifier body size swamp buffalo in Karo is hip hight for the District Munte shoulder, hip height for the District Kabanjahe is and chest width for the District Mardingding. However identifier body size buffalo in Bombana island areas was the same to report by Saroji et al. (2010) which states that the body size variable identifier Sajira and buffaloes in the district and Padeglang Cibadak Lebak district of Banten Province is chest circument.

Eigen value of the first main component (vector size) buffalo in Bombana mainland area was 1380.60 with total value of diversity vector size by 69.30%. It was mean that the total diversity of all the variables body size buffalo in this area, amounting to 69.30% could be explained by the first main component (body length) which is a variable identifier buffalo body size in mainland area Bombana. While the eigenvalues of the first main component (vector size) of buffalo at Bombana island areas was 1532.30 with a total value of diversity vector size was 73.50%. It was mean that the total diversity of all the variables body size buffalo in this area, amounting to 73.50% could be explained by the main component I (chest circumference) which is an identifier variable body size buffalo in Bombana island areas.

Body shape

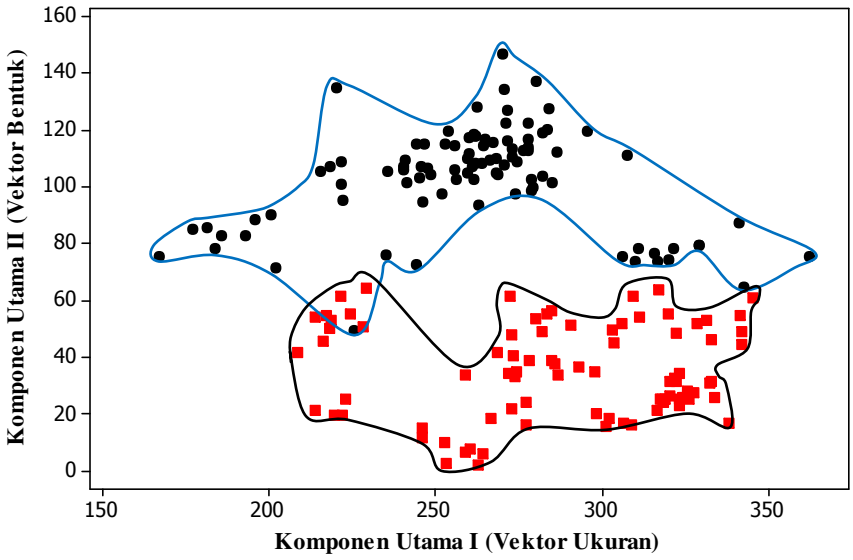
Results of principal component analysis (Table 24) showed that the value of the highest eigenvectors in equation buffalo body shape in Bombana mainland area found on chest circumference (0,686X3). While the value of the highest eigenvectors in equation buffalo body shape in Bombana island areas found on the long head (0,730X7). Based on the highest Eigen value equation vector shape, then the variable identifier in the shape of buffalo body in Bombana mainland area was chest circumference (X3) and the variable identifier buffalo body shape in the islands was head length (X7).

Identifier buffalo body shape in the mainland and in the islands region Bombana in this study was different from the report by Sembiring. al., (2013) which states that the shape identifier of buffalo in Karo is high hip for the District Mardingding, wide chest for the District Kabanjahe and in

the chest for the District Munte. Identifier buffalo body shape (mixed sex) in mainland area equal to the identifier Bombana body shape female buffalo in District Cibadak and District Lebak and Pandeglang of Banten province (Saroji at al., 2010), while the buffalo body shape identifier (mixed sex) in the Bombana islands region (body length) equal to the identifier body shape male buffalo in District Sajira Lebak district of Banten province and Pandeglang (Saroji at. al., 2010).

The main component II Eigen values (vector shapes) in the mainland buffalo Bombana at 320.10 with a total value of diversity vector size was 16.10%. It was mean that the total diversity of all the variables body size buffalo in this area, only amounted to 16.10% could be explained by the major component II (chest circumference) which is an identifier variable shape buffalo in Bombana land area. While the eigenvalues of the second main component (vector shapes) buffalo at island areas of Bombana was 264.80 with a total value of diversity vector size was 12.70%. This means that the total diversity of all the variables body size buffalo in this area, only amounted to 12.70% could be explained by the principal component II (long head) which is a variable identifier in the form of body size buffalo Bombana island region.

The cumulative value of the diversity of the main components I (vector size) and the main component II (vector shape) body buffalo in mainland area reached 85.30% Bombana. It was mean that the total diversity of all variable- ukuran tubuh size buffalo male body size in land area Bombana of 85.30% could be explained by two main components. While the diversity of the cumulative values of the main component I (vector size) and the main component II (vector shapes) at island areas, body of Bombana value reached 86.20%. It was mean that the total diversity of all variable-size buffalo body size in island areas Bombana was 86.20% could be explained by two main components. The size and shape of the body diagram buffalo (mixed sex) in the mainland and islands of Bombana presented in Figure 4. It could be seen that the score data vector crowd buffalo body size in island areas tend to be on the score value greater than the buffalo in Bombana land area. The difference in the value of the score vector body size between the two populations of buffalo is also reflected by differences in body weight. The average weight of buffalo (mixed sex) at island areas reached 456.58 ± 113.64 kg (n = 86), whereas in the mainland only reached 378.18 ± 97.70 kg (n = 95). However, in Figure 6 showed that the distribution of score data vector shape buffalo in land area explicitly different from Bombana island areas. Buffalo in land area had a score vector form using large body more than in Bombana island areas.



Remarks: ● = Mainland area; ■ = Island area

Figure 6. Diagram of body size and shape of buffalo in Bombana district.

Based on the results of principal component analysis concluded that the dimensions of the body (morphometric) buffaloes in land area explicitly different from Kabaena island areas, which is indicated by the size of the identifier and the identifier of different body shapes including mean different body weights. Morphometric character differences in the two populations of buffalo in Bombana allegedly attributed to differences in environmental conditions and maintenance management between mainland and island regions. The survey results indicate that the buffalo in land area Bombana maintained by means of detachable continuously on pasture with arid soil conditions (Figure 5), so availability is limited and forage in the dry season farmers were having trouble finding a source of water. Supplementary feeding to the buffalo in this area was also not done. At certain times such as when there were vaccination services from local farm workers, the buffalo were herded by motorcycle to the paddock which is not far from the location of pastureland. Buffalo grazing in this area conducted jointly with the cattle, so that there was competition between buffalo and cattle to obtain forage, while pasture forage conditions are very limited. In addition, access to the location of pasture land in the area is very open because it is located on the edge of the highway, thereby disrupting buffaloes.

Breeding of buffalo in the island area was not much different from the mainland area by means of continuously released, but the environmental conditions of both areas were very different. The pasture soil condition in the island area was quite fertile that enough forage available (Figure 6). Similarly, water resources were available even in the dry season. In addition, the location of buffalo grazing in the island areas was quite far from the highway so it did not interfere with vehicle traffic noise.

(a) (b)

Figure 7. Pasture conditions in Bombana (a) mainland and (b) island areas

CONCLUSION

Based on the results and discussion, it can be concluded as follows: (1) portrait of body weight of swamp buffalo in mainland region significantly lower than the island areas (Kabaena island) with a high variation, which is 23.73% in males and 29.60% in female buffalo, (2) portrait of body measurement in the Bombana swamp buffalo generally not significantly different ($P>0.05$) between the mainland and island regions, except the hip width, (3) the main component identifier of buffalo body measurements diversity in mainland area was body length, which is 69.30% and the island areas was chest circumference in the amount of 73.50%.

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The Clinical Symptom and Anatomical Pathology of Tolaki Chicken which Infected Newcastle Disease Viral

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ABSTRACT

This study aim was observatiion the clinical and anatomic pathology Tolaki chicken infected virus Newcastle Disease (ND) as an affirmation analysis of the cause of the viral disease. A total of 30 Tolaki chickens divided into 3 groups based on the Mx (Myxovirus) gene genotype. Mx gene is a gene that is antiviral, producing three genotypes (AA, AG and GG), respectively 10 chicks kept in separate cages. Challenge test performed by infection with a virus gene ND VII eye drops at a dose of 104 CLD50 /0.5 ml / head. The results showed that in the first week of chicken genotype AA, AG and GG generally show the same clinical symptoms such as ducking, breakaway, face swollen, snoring. Chicken looks decreased appetite and green diarrhea are found in the feces. The number of chickens that died at the AA and AG there are three tails, while the GG Chicken found 6 tail. In the second week the AA genotype was not found green diarrhea, while the AG and GG discovered green diarrhea. The number of chickens that died at the AA and AG there are two tails, while GG was found dead three tails. Total chickens that died at the AA and AG found as many as 5 tails, while the GG as many as 9 tails. Generally the infected chicken ND virus causes swelling of the spleen, bleeding/redness of the intestine and trachea in all genotypes. Swelling of the spleen in the AA genotype was found to be 20%, AG and GG 60% of 100%. Spleen were obtained blackish color on the GG genotype of 44.44%. Based on changes in anatomic pathology in this study was obtained characteristics ND diseased chickens, so the chickens have been infected with the virus diagnosed ND. Patognomosis changes in anatomical pathology characterized by hemorhagi enteritis in the gastrointestinal tract (gut) and respiratory tract (trachea). Based on the results of the ND virus challenge test to prove the group challenged chickens have been infected with ND virus. ND virus infection attacks the intestinal organs, trachea, and spleen affecting the decline of the immune system in all genotypes. AA and AG genotypes have better protective properties against ND virus infection than genotype GG.

Key Words: Clinical Symptom, Anatomy Pathology, Tolaki Chicken, and ND Viral

INTRODUCTION

Disease resistance is a natural mechanism of each living creature in order to survive. Indicators of real resistance to the disease can be seen in adaptability and subsequently reproduce well on an environment. Local chickens are able to adapt to the poor environment, are able to live in the wild and resistant to disease. This suggests that local chickens have the ability immune response in the form of self-defense mechanism against infectious diseases including viral. This defense mechanism is controlled by a number of genes that are antiviral particularly Mx gene (Myxovirus) (Maeda, 2005; ;Pagala and Nafiu, 2012 ; Pagala et al, 2013). Chicken has a very high genetic diversity. This is one of the strong basis why genetic diversity is associated with chicken resistance against several diseases including influenza virus attacks, there is a strong correlation between high genetic diversity and frequency of alleles in the gene responsible for resistance to a disease of chicken. This

is evidenced by studies showing a high frequency distribution of the A allele (genotype AA), which is resistant to influenza viruses in chicken left alive in the wild, in contrast to the chicken broiler which has undergone a process of unification of genetic shows the distribution of frequencies of alleles A very small close to zero (Sulandari et al. 2007). Indicators of chickens to disease resistance can not only be based on genetic diversity in a group of antiviral genes, but can also be based on clinical symptoms and pathology, anatomy. This study aimed to examine the association between genotype Mx gene with the ability of immune response in chickens infected Tolaki Newcastle Disease virus

MATERIALS AND METHODS

Place and Time

The research location is housed in cages Poultry Field Laboratory Faculty of Animal Breeding Unit haluoleo university. DNA extraction and amplification of DNA Mx gene performed at the Laboratory of Molecular Breeding and Genetics Department of the Faculty of Animal Husbandry IPTP. The research was conducted from April to August 2013.

Research Material

The sample used in this study is the Tolaki chicken taken from several areas in South Konawe Southeast Sulawesi province as much as 25 tails. Blood sampling and feathers done in Phase I (first) study, further laboratory analysis at the second stage in the Laboratory of the Faculty of Animal Husbandry Department IPTP. Materials used are chemicals for blood sampling, extraction of DNA, DNA amplification, gel electrophoresis, and Silver Staining include: EDTA, Trs, HCL concentrated, potassium acetate, deionized water, NaCl, NaOH, SDA, sodium acetate, acid acetate, phenol, absolute ethanol, chloroform, isoamyl alcohol, and proteinase K, agarose, bromfenolblue, ethidium bromide, DNA marker 100 pb leader, Tris-Borate-EDTA, MgCl2, dNTP, Taq polymerase and random primers.

The tools used PCR machine, electrophoresis, autoclave, vacuum tainer, micro pipette, pipette tips, disposable glove, centrifuge, vortex, beaker, magnetic stirrer, eppendorf tube, appliance thremocycler, UV lights, camera paraloid.

Research Methods

DNA extracted from blood samples of blood samples in tubes EDTA take in to the micro tube (1.5 ml) was then added to 1000 mL of DW / TE (NaCl 0.2%). After vortex and allowed to stand 5 minutes, then centrifuged at a speed of 8000 rpm for 5 minutes. Supernatant solution formed discarded. The next phase, the addition of 40 mL of 10% SDS, 10 mL proteinase K 5 mg / ml and 1 x STE (Sodium Tris EDTA) as much as 300 mL. The next solution is gently shaken in an incubator at 55 0C for 2 hours. Phenol was then added 400 mL, 400 mL CIAA (Chloroform: Isoamyl alcohol = 24: 1), and 40 mL of NaCl 5 M shaken slowly at room temperature for 1 hour and then centrifuged at a speed of 12000 rpm for 5 minutes. Clear solution containing DNA was transferred as much as 400 mL to 1.5 mL eppendorf tube new. Then added 800 mL of EtOH (absolute ethanol) and 40 mL of NaCl 5 M then stored in the freezer overnight. The next phase solution was centrifuged again at a speed of 12000 rpm for 5 min, the supernatant was discarded and ignored formed in an open state or in a desiccator until the alcohol is gone. The last stage was added 100 mL of TE 80% or elution buffer which serves as a buffer. DNA obtained is then stored in the freezer until used (Sulandari and Zein, 2013).

DNA extracted from samples

Feather samples that can be used a whole feather sample, which has a section chalamus. DNA extraction from feather samples was performed using extraction kit Phire Animal Tissue Direct PCR Kit (Thermo Fisher Scientific Inc.). Extraction procedure carried out following the instructions of the kit manufacturer as follows: ± 0.5 cm in the first part (root / chalamus) fur transferred into 1.5 ml

tubes, then cut to be some small part. At the 1.5 ml tube was added 20 mL dilution buffer and 0.5 mL of DNA Release ™ Additive. The mixture is stirred using a vortex tube and then centrifuged. After the mixture was incubated for 2-5 minutes at room temperature and continued for 2 minutes at a temperature of 98 ° C. DNA samples ready for use or stored at -20 ° C for use later. Sambrook et al, 1989)

Segment Mx Gene Amplification by PCR

DNA samples were amplified by PCR machine (Polymerase Chain Reaction) (Muladno, 2010). Specific primers to amplify the gene Mx based Sironi et al. (2010) is the foward primer (5'-GCA TCA CCT CTG CTT AAT AGA-3 ') and reverse (5'-TTG GTA GTA GGC TTT GTT GA-3'). DNA amplification performed in a total volume of 25 mL consists of 2 mL (10-100 ng) of DNA, 15.75 mL sterile deionized water; 2.5 mL of 10 × buffer without Mg 2+; 2 mL MgCl2; 0.5 mL of 10 mM dNTP; 0.25 mL of Taq polymerase; 2 mL (25 pmol) primer. Phase 1 study with 1 x cycle, covering the initial denaturation at 94 ° C for 4 minutes. Phase II carried out with 30 x cycle, including denaturation at 94 ° C for 10 seconds, annealing at 60 ° C for 1 min, the elongation of the DNA molecule at a temperature of 72 ° C for 2 minutes. Phase III is done with 1 x cycle, covering the end of the DNA molecule elongation at 72 ° C for 7 min. Incubate at 4 ° C until used for further analysis. Electrophoresis Electrophoresis of DNA fragments amplified by PCR was performed using the device electrophoresis on 2% agarose gel (0.5 g / 25 ml of 0.5 X TBE). Road device using 0.5 X TBE buffer, at a voltage of 100 volts for 30 minutes. Viasualisasi gel elktroforesis performed on the gel documentation Alpha Imager (Alpha Imager).

Data Analysis

Based on the results of DNA extraction and amplification is then performed a qualitative analysis by comparing the DNA bands generated view of the two methods of extraction of DNA in gel electrophoresis.

RESULTS AND DISCUSSION

Symptoms Clinical and Anatomical Pathology Chicken Challenge

Early action undertaken in the handling of cases of the disease in poultry is to analyze the cause of which is the source of the disease. One approach in analyzing the cause of the disease is to look at the clinical symptoms and continued by analyzing the picture after death in the form of anatomical pathology of poultry nekropsi.

Clinical symptoms

Tolaki chickens infected with ND virus providing immunity response in the form of clinical symptoms as shown in Table 1.

Table 1. Clinical symptoms chickens challenged with the ND viral

Clinical symptoms	First Week			Second Week		
	AA	AG	GG	AA	AG	GG
Ducking	+	+	+			
Secede		+	+		+	
Decreased appetite	+			+	+	+
Face swelling	+			+	+	+
Snoring	+		+	+		+
Diarrhea Green	+	+			+	+
Exudat				+		
Mortality	3	3	6	2	2	3

Description: (+) = The clinical symptoms identified

Based on data from Table 1, shown in the first week of chicken genotype AA, AG and GG showed the same clinical symptoms such as ducking, breakaway, face swollen, snoring. Chicken looks decreased appetite and diarrhea are found in the stool green. Differences were seen in clinical symptoms evenly AA, AG predominantly on green diarrhea, while the GG dominated by ducking, splits and snoring. The number of chickens that died at the AA and AG there are three tails, while Chicken GG 6 tail was found dead. In the second week, chicken genotype AA, AG and GG still exhibit similar clinical symptoms but with greater frequency (dominant). Differences were seen in AA was not found green diarrhea, while the AG and GG discovered green diarrhea. The number of chickens that died at the AA and AG there are two tails, while GG was found dead three tails.

Based on the clinical symptoms group of chickens who are challenged, such as swelling of the face and eyes, feces green and chicken looked lethargic with a decreased appetite drastically to cause death suddenly in chickens showed chickens have been infected with ND virus belonging to the types of viscerotropic velogenic newcastle disease (VVND) (Alexander 2003; Alders and Spadbrow 2001). Based on the speed of the spread of the virus (morbidity) and the number of chickens that died (mortality) in Table 4.3, shows the first week of AA and AG genotype is almost the same with the chicken deaths each 3 tails, while the GG genotype mortality is high enough that 6 tail. Similarly, in the second week of AA and AG genotypes dtemukan dead chickens each 2 tail, while the GG was found dead chickens as many as 3 heads. Total chickens that died at the AA and AG found as many as 5 tails, while the GG as many as nine tails. This means the high pattern of morbidity and mortality caused by viral infections this ND. Newcastle disease is a disease which has been classified as a respiratory disease in chickens, which have the clinical symptoms is similar to other respiratory diseases such as AI, IB, ILT, and CRD Coryza, the difference is in the epidemiological and clinical characteristics of the particular. Newcastle disease and AI has a similar epidemiological characteristics, namely the speed of the spread of disease (morbidity) and the number of chickens that died (mortality) is very high (Tarmudji 2005).

Chickens that have resistance to the disease tends to look normal and showed no clinical signs or commonly called sub-clinical manifestations. In this study obtained challenged chickens that do not show clinical symptoms even though the virus has infected chickens ND, namely each as much as 5 mice in AA and AG genotypes. Allegedly these chickens showed symptoms of subclinical manifestations. Sub-clinical manifestations can occur when the disease in a region already is endemic. In this condition, disease agent does not cause symptoms in landlord and landlady did elimination of the agent of the disease.

In principle, the subclinical manifestations of ND, occurs when the landlady (chicken) to form an inadequate immune response, so it is not quite able to kill the infecting virus as a whole. Some causes of manifestations of subclinical ND, including: The nature of viruses are always changing so that antibodies in chickens did not recognize him perfectly, seed vaccine less proportional to the level of homology seed vaccine and the virus is very low, the application of the vaccine is not appropriate, chicken only vaccinated once so production antibodies are not adequate, and the condition of the disease was endemic. (Wibawan 2012).

Pathology (PA)

In the diagnosis of disease in chickens, in addition to general clinical symptoms may be followed by anatomical pathology approach in the form of post-death examination after surgery chickens. Table 2 shows the changes in anatomical pathology chickens infected with ND virus.

Diagnosis of the disease in animals can be done through the examination of histological, serological, bacteriological, virological and after death, but if there is a high mortality rate that can be performed surgical technique carcass examination (necropsy) to get results fast and accurate diagnosis (Tarmudji 2005). As a provisional diagnosis to prove the existence of acute Newcastle disease, it can be done based on examination of the epidemiology, clinical symptoms, and the last is the pathological changes that patognomosis before confirmation of the diagnosis made based on the results of the isolation and identification of viruses (Alexander 2001).

Table 2. The Changes of anatomic pathology groups of chickens were challenged with the ND viral

Anatomic Pathology	Chickens Challenged (Living)			Chickens Challenged (Dead)		
	AA (5)	AG (5)	GG (9)	AA (5)	AG (5)	GG (1)
Swollen spleen	1/5	3/5	9/9	0/5	0/5	0/1
Black spleen	0/5	0/5	4/9	0/5	0/5	0/1
Intestinal bleeding	5/5	5/5	9/9	0/5	0/5	0/1
Tracheal bleeding	5/5	5/5	9/9	0/5	0/5	0/1

Description: (..) = number of samples

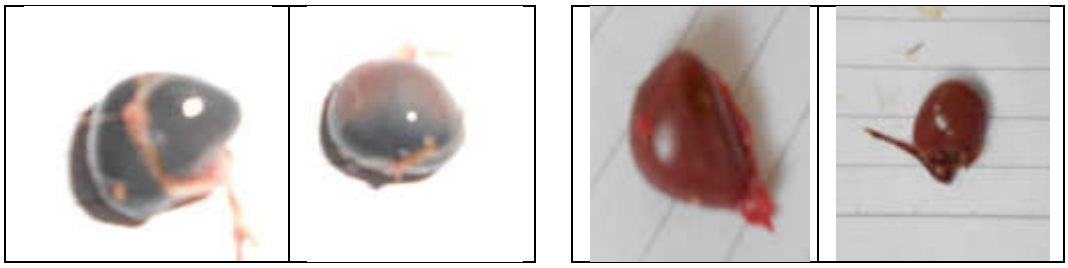
Diagnostic pathology approach requires the examination and the conclusion of an illness based on the observation of abnormalities of cells, tissues, or organs due to a disease process. Some diseases that have pathological changes that distinguish (patognomosis), diagnosis patologiknya will have a high degree of accuracy. Approximately 90% of disease in chickens are most commonly found in Indonesia can cause damage to the macroscopic and microscopic specific tissue / organ targeted, so that the disease can be diagnosed by the PA, but when changes in the PA does not distinguish, then the determination of the diagnosis should be supported by laboratory tests.

Table 3. Percentage Changes Of Anatomic Pathology Of Post Dead Chickens Were Challenged in Tolaki Chicken

Pathologi anatomi (PA) changes	Genotipe		
	AA (5)	AG (5)	GG (9)
Swelling of the spleen (%)	20.00	60.00	100.00
Spleen color black (%)	0.00 (Figure 4.1b)	0.00 (Figure 4.1b)	44.44 (Figure 4.1a)
Intestinal bleeding / hemorhagi enteritis (%)	100.00 (Figure 4.2a)	100.00 (Figure 4.2a)	100.00 (Figure 4.2a)
Tracheal bleeding / hemorhagi enteritis (%)	100.00 (Figure 4.3a)	100.00 (Figure 4.3a)	100.00 (Figure 4.3a)

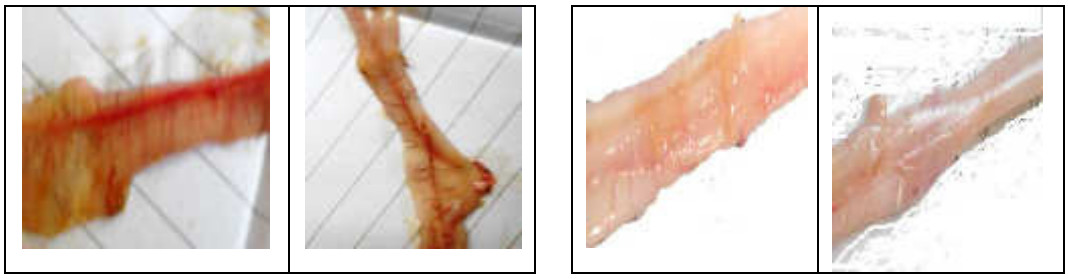
Surgery done on the carcasses of chickens that died after challenge test to see pathological anatomy. Generally the infected chicken ND virus causes swelling of the spleen, bleeding / redness of the intestine and trachea in all genotypes. Swelling of the spleen in the AA genotype was found to be 20%, AG and GG 60% of 100%. Spleen were obtained blackish color on the GG genotype of 44.44%. Based on changes in anatomic pathology in this study was obtained characteristics ND diseased chickens, so the chickens have been infected with the virus diagnosed ND. Patognomosis changes in anatomical pathology characterized by hemorhagi enteritis in the gastrointestinal tract (gut) and respiratory tract (trachea) as stated Kencana and Kardena (2011); Tabbu (2000) that changes in anatomical pathology patognomosis on Newcastle disease characterized by hemorhagi enteritis in proventriculus, ventrikulus, wipe the tonsils, colon, trachea and lungs.

Changes in anatomical pathology of chickens infected with ND virus is presented in Figure 1, Figure 2 and Figure 3



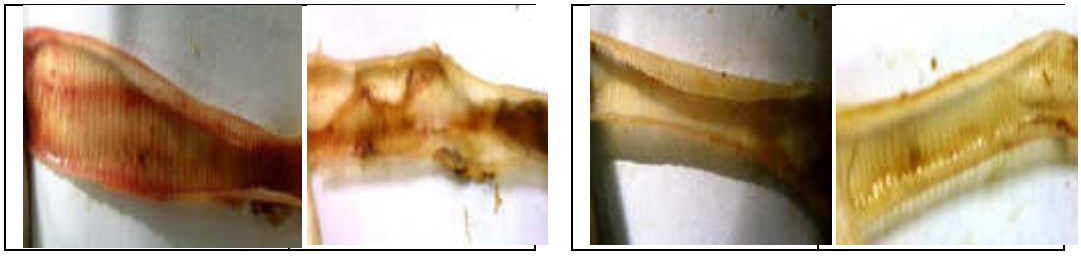
(a) (b)

Figure 1. Spleen; (a) = black spleen organ found in chickens challenged GG after death; (b) = spleen is normally found in chickens challenged AA and AG were still alive as well as the control chickens.



(a) (b)

Figure 2. Intestinal organs; (a) = bleeding intestinal organ found in all genotypes after dead chickens challenged; (b) = normal intestinal organ found in chickens challenged surviving and control chickens



(a) (b)

Figure 3. Organ trachea; (a) = bleeding tracheal organ found in all genotypes after dead chickens challenged; (b) = normal tracheal organ found in chickens challenged surviving and control chickens

Anatomical pathology seen in the form of swelling of the spleen and blackish in color (only in genotype GG), bleeding in the trachea and intestine at all chickens challenged indicated ND virus has spread to all organs and managed to penetrate the mucosa propria. ND virus infection were given lower the durability of chicken. ND pathogenic viruses causing damage to several organs and the impact on mortality of chicken (Alexander 2001)

CONCLUSION

Based on the results of the ND virus challenge test and fenotiping in this study, proving the group challenged chickens have been infected with ND virus. ND virus infection attacks the intestinal organs, trachea, and spleen affecting weight gain decline in all genotypes, whereas the control group showed weight gain chicken better at AA and AG genotypes compared to genotype GG. AA and AG genotypes have better protective properties against ND virus infection than genotype GG.

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Body Condition Score of Bali Cows: Its Effect on Reproductive Status

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ABSTRACT

The study was aimed at scoring the body condition of Bali cows and its effect on the reproductive status. It was conducted in 14 smallholder farms in Bantaeng, South Sulawesi Province, Indonesia. A total of 64 Bali cows were involved in the study. All cows were subjected to body condition scoring (BCS; scale 1 - 9) and then clinically examined for reproductive status. The results of this study showed that most of cows had lower BCS (68%) and only 32% had BCS 5 or greater. A proportion of cows with parities 1 and 2 were 61%, higher than parities 3 and 4; 28% and parity 5 or greater; 25%. This study also noted that proportions of cows pregnant, cyclic and anestrous were 25%, 9%, and 66%, respectively. Interval from calving (mean ± SD) to conception of these Bali cows was relatively longer 191.3 ± 115.7 days and it expected calving interval of the cows approximately 476 days. In conclusion, the Bali cows exhibited lower reproductive performance and lower BCS was the contributory factor.

Key Words: Bali Cows, BCS, Reproductive Status, Reproductive Performance

INTRODUCTION

The most popular cattle raised by farmers in South Sulawesi Province, Indonesia are Bali cattle. These cattle originated from Bali Island. Proportions of these cattle are smaller than many breed, such as those in Europe and other west countries. These cattle have been well known their good reproductive performance. Lately, however, the reproductive performance of Bali cattle has decreased. Nutrition is believed to be the contributory factor. Body condition score (BCS) of the cattle is a reflection of the animal's diet. Body condition or changes in body condition, rather than live weight or shifts in weight, are a more reliable guide for evaluating the nutritional status of a cow (Herd and Sprott, 1996). Therefore, measuring BCS of the cows might be used to predict subsequently the cow's fertility.

Fertility, a component of reproductive performance, defines the ability of the female to become pregnant, but it is ultimately reflected in the birth of a calf (Rodriguez-Martinez et al., 2009). Furthermore they stated that fertility is usually monitored by indirect rates of non-return to estrus or by the more accurate conception or pregnancy rates, whereas monitoring is resulting from clinical examinations. This examination must be undertaken comprehensively, including regularly monitoring the cows' BCS as one of the factors affecting fertility. To achieve high conception or pregnancy rates in cows, therefore, it is necessary to have better BCS through sufficient nutrient intake.

The main objective of a cow–calf production system is to yield a high calf crop each year, which is the primary factor that impacts on profit ability (Martins et al., 2012). A high calf crop is dependent on optimal reproduction, which is one of the most important factors affecting the financial viability of a cow–calf enterprise (Martins et al., 2012; Hess *et al*., 2005). Considering the importance of BCS in relation to the reproductive performance of the cows, the objective of the

present study was to score the body condition of Bali cows and its effect on their reproductive status.

MATERIAL AND METHODS

Bali Cows and Raising Management

This study involved 64 Bali cows. The cows were raised by 14 farmersin smallholder farms in Bantaeng Regency, South Sulawesi Province, Indonesia. The farms were visited for reproductive examination and scoring for body condition as well as parity. Cows were confinedin a simple housing of each farmer during night-time and sent out to the field at day-time for grazing.

Scoring Body Condition and Reproductive Examination

Body conditionscore (BCS) of all cows was recorded (BCS: scale 1 to 9)(Momont and Pruitt, 1998; Mathis *et al.*, 2002).Clinical reproductive examination was conducted. First, the cows were restrained in AI stanchion prevent the animals from moving. Then palpation per rectum of the genitalia was conducted to assess uterine conditions and ovarian structures (Yusuf et al., 2010). Determination of uterine condition was performed, including contraction, elasticity, tonicity, and symmetry of uterine horns and the presence of any fluid in the uterus (Gautam et al., 2010). The cows were considered pregnant as indicated by uterine development; otherwise were considered not pregnant.

Non-pregnant cows were then assessed for their ovarian functions. The ovaries without any palpable structures of the follicle and/or CL were considered inactive (Yusuf et al., 2010). Presence of the large follicle or dominant follicle and/or corpus luteum (CL) without any development of uterine was considered cyclic.

Statistical Analyses

All data were tabulated and calculated using the Microsoft Excel software for MS Windows. Percentages of BCS and parity were calculated by number of cows at each level of BCS and parity divided by total number of cows multiplied by 100. Similarly, pregnant, cyclic and anestrous cows were calculated by number of cows at each level of pregnant, cyclic and anestrous cows divided by total number of cows multiplied by 100. Intervals from calving to conception were calculated as number of days from calving to conception. Days after calving for anestrous cows were calculated as number of days from calving to the time of examination.

RESULTS AND DISCUSSION

Farm Management

The cattle covered by the study are extensively raised by farmers in the region where the study was undertaken (Fig. 1). It is common that the farmers bring their cattle to the field or grassland for grazing in the morning and returned back to the farm in the late afternoon. This prevailing practice is due to the fact that not all the farmers have special land for planting forage hence it is easier for them to simply keep their cattle in the field for grazing. For the farmers who have available land, they planted such as elephant grass. During the dry season, however, this plantation would not help much, and in order to maintain the cattle, the farmers usually let them grazing in the ricefields.

In Indonesia, more than 90% of beef cattle producers are situated in small farms. Since the cattle in small farms are raised extensively, many factors limit and reduce the productivity of the animals during their lifetime. This situation requires more attention and strategies to increase the productivity of cattle in small farms. An effort to optimize or increase the productivity of cattle, especially among Bali cows in the region, is necessary. Many aspects, such as raising management, nutrition and reproductive management, among others, have to be approached in a holistic manner.

Chenoweth (2012)suggested that in order to achieve high level of productivity in extensive cattle-raising, it is necessary to consider many factors, including optimizing the role of extension, higher education and modern technologies. Taking these factors holistically in small farms would maximize the productivity of the cows and, in turn, contribute not only to national economies, but also to sustainability and profitability of agriculture, as well as to the fabric of local societies (Chenoweth, 2012).

Figure 1. Bali cattle and the farmer

Body Condition Score (BCS) and parity of the Cows

Fig. 2 shows the BCS of the cows used in the present study. About only 32% of the cows had BCS 5 or greater and the other 68% had BCS 4 or lower. This indicated that mainly, cows raised by the farmers suffered from under nutrition, which makes it difficult for the cows to get pregnant. Several studies have shown the positive relationship between BCS and reproduction. Lamb (2012) stated that there are intricate relationships indicating interaction between nutrition and reproduction. From a nutrition standpoint, energy, protein, minerals and vitamins all affect reproduction through various avenues. The hypothalamus, pituitary and/or the ovaries can be affected by nutritional deficiency.

Lower BCS of the cows used in the present study might be caused by under nutrition, which appears to have an effect on the animals' reproductive hormonal mechanism. Flores et al. (2008) concluded that under nutrition of cattle may be communicated to the hypothalamic-pituitary-ovarian axis via metabolic hormones, including IGF-1, thyroid hormones or prolactin. This condition, in turn, affects the reproductive processes in cows.

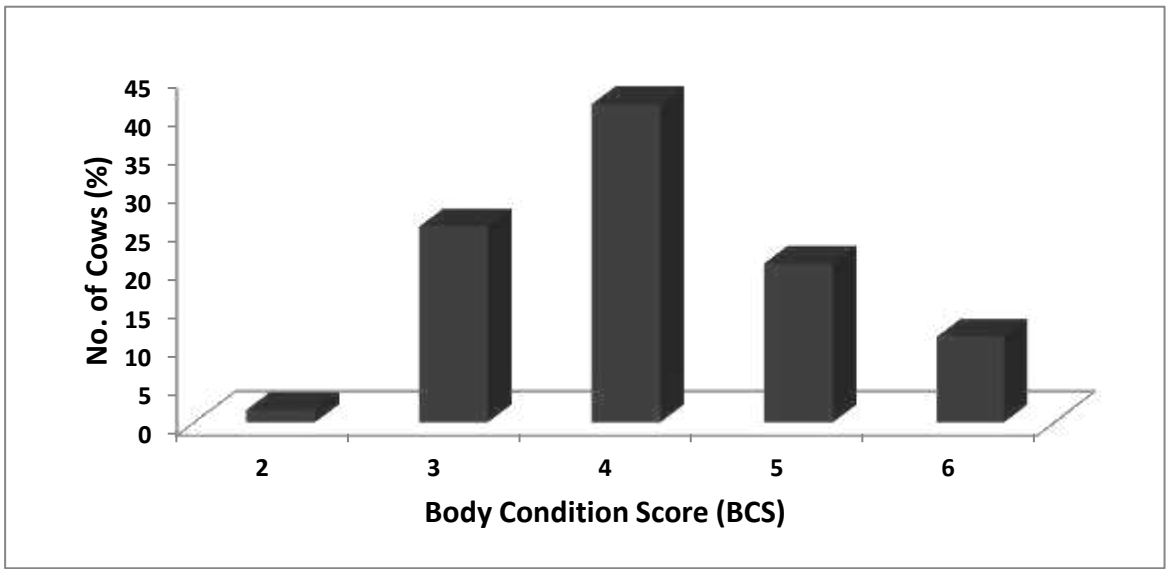

Fig. 2. Body condition score (BCS) of Bali cows that raised in small holder farms

Distribution of Bali cows at different parities is shown in Fig. 3. A proportion of cows with parities 1 and 2 were 61%, higher than parities 3 and 4; 28% and parity 5 or greater; 25%. This means that mostly Bali cows are in the population with lower parities. High percentage of cows with parities 1 and 2 in this study may indicate that Bali cows after first or second calving have difficulty conceiving for the subsequent pregnancy. Therefore, it is vital to maximize and improve the reproductive potential of Bali cows by focusing on reproductive technology management. This allows the potential cows to increase the number of offspring during their lifetime.

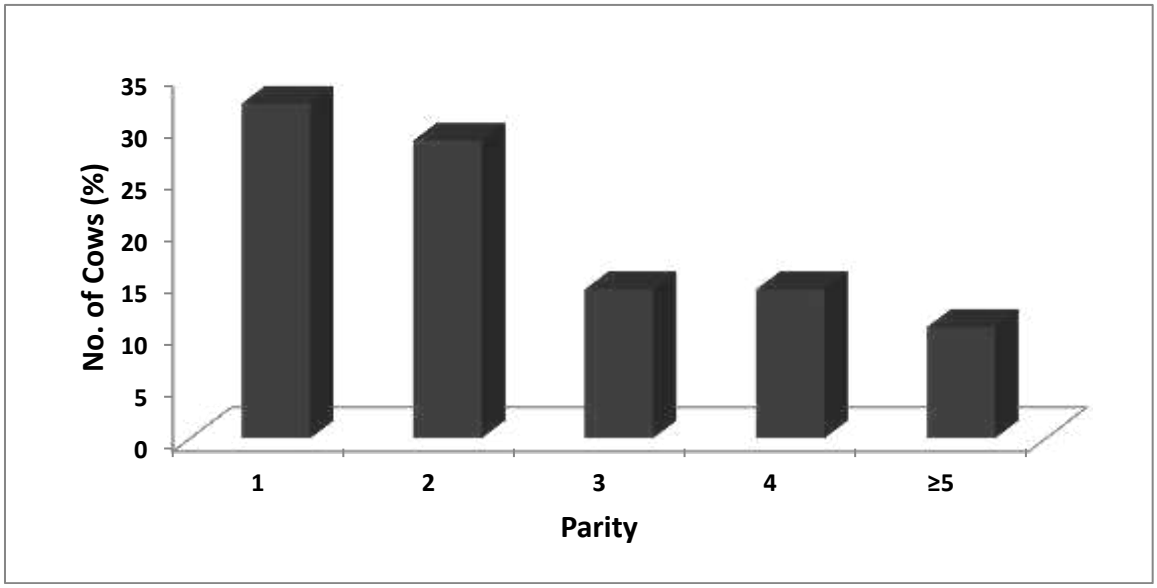

Fig. 3. Parity of Bali cows in small farms.

Reproductive performance of Bali cows

At the time of examination, all cows under the study were subjected to palpation per rectum to examine their reproductive status. In the Bali cow population, we noted that about 25% were pregnant, 9% cyclic, and the other 66% in anestrous (Fig. 4). Lower proportion of pregnant and cyclic cows in this study suggested low reproductive efficiency. Interval from calving (mean ± SD) to conception of Bali cows was 191.3 ± 115.7 days. It means that expected calving interval was approximately 476 days or greater than 15 months.

Low reproductive performance in Bali cows in the present study had high relationship with the high incidence of anestrous as shown in Fig. 4. Causes of this incidence are not well understood. Lower BCS of these cows is suspected to be contributory (Fig. 6). Therefore, optimal reproductive performance in beef cows is often limited by prolonged postpartum anestrous intervals (Ciccioli et al., 2003) and needs to be shortened to achieve high performances.

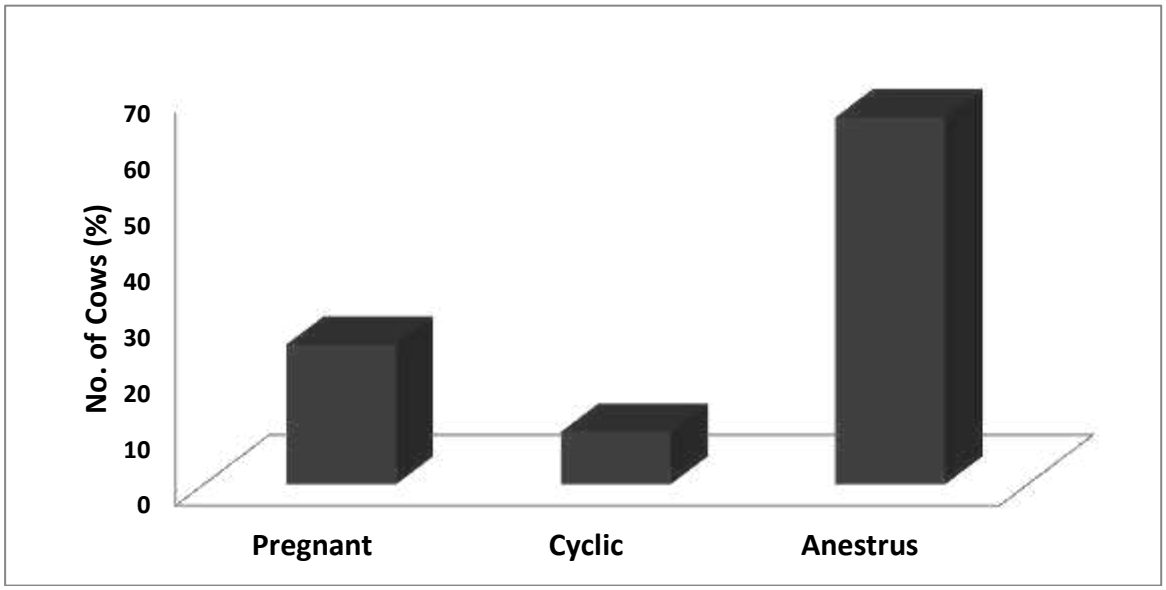

Fig. 4. The Reproductive status of Bali Cows

Anestrous cows

The most critical factors affecting long calving interval in cows is long period of anestrous. Therefore, to achieve optimum time of calving interval, anestrous postpartum should be as short as possible. In this study, we confirmed high variation of anestrous cows after calving (Fig. 5).Up to 85 days after calving, anestrous cows were approximately 57% and the remaining 43% was greater than 85 days postpartum. At best, cows should become pregnant at 85 days postpartum in order to achieveoptimum calving interval.

Several factors may affect long anestrous postpartum. One of these factors is BCS. This study confirmed that there was significant (P=0.0027) effect of BCS on reproductive status (pregnant, cyclic and anestrous). BCS in anestrous cows was significantly (P=0014) lower than in pregnant cows (3.9 vs. 4.8) (Fig. 6). This result was in agreement with the study of Drennan and Berry (2006) [13] that showed pregnant cows had higher BCS. Likewise, cyclic cows had higher BCS than anestrous cows (4.5 vs. 3.9; P=0.1149). Lower BCS of cows extends period of postpartum anestrous (Lake et al., 2005; Hess et al., 2005) and subsequently prolongs interval from calving to first ovulation as well as conception.

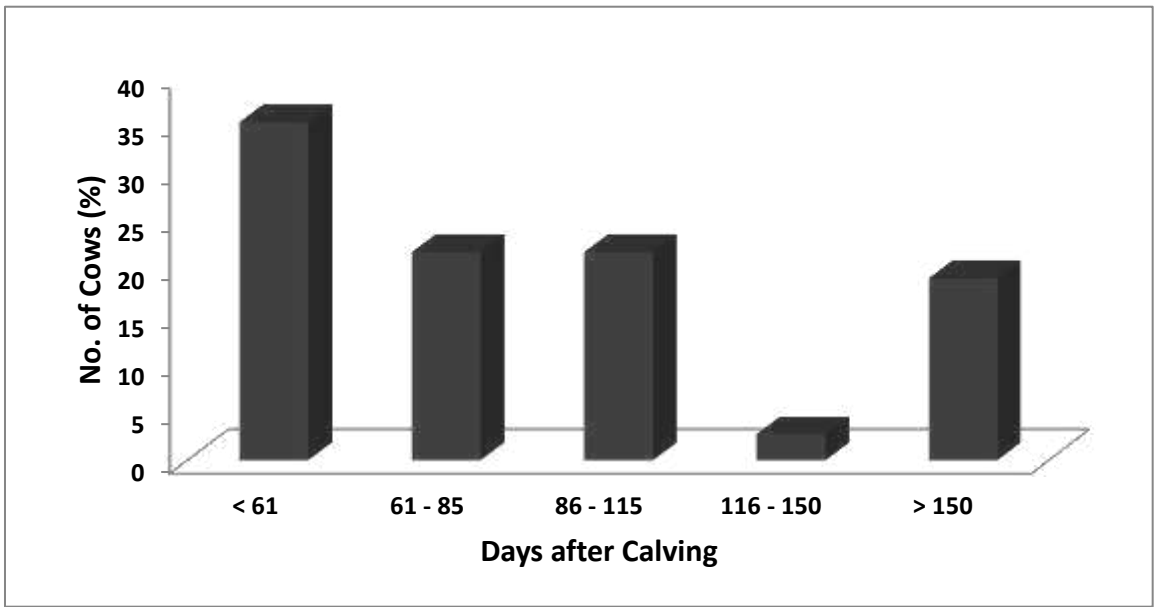

Fig. 5. Days after calving of anestrous cows at the time of examination

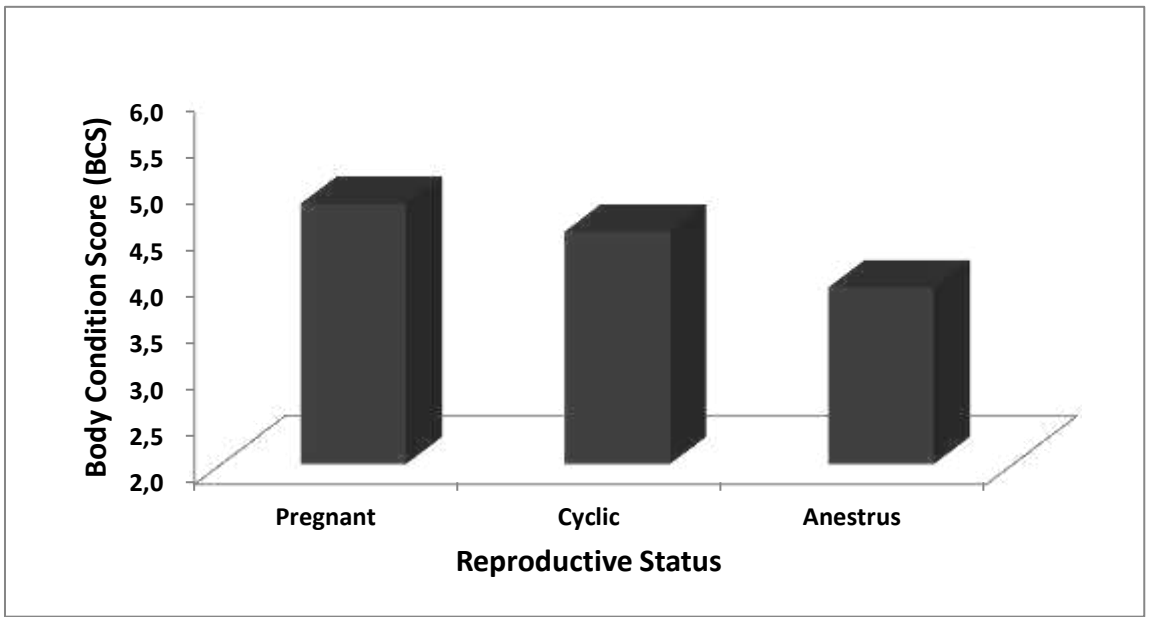

Fig. 6. Body condition score (BCS).

CONCLUSION

In conclusion, reproductive performance of Bali cows has decreased and it appears that lower BCS was the contributory factor.

ACKNOWLEDGMENT

The authors wish to thank the Directorate General for Higher Education of Indonesia, Institute for Research and Community Services of Hasanuddin University for supporting this study via Higher Education Competitiveness Research (Penelitian Unggulan Perguruan Tinggi). Our sincere thanks also go to the farmers in Bantaeng Regency involved in this study for their cooperation.

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The Quality of Fresh Semen of Bulls at 5^0C and 24^0C With or Without Diluent

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ABSTRACT

The aim of this study was to determine the quality of fresh sperm cattle at 5^oC and room temperature and used of diluent. The study was conducted at the Laboratory Animal Husbandry Faculty of Kanjuruhan University. Research material used was fresh sperm cattle that obtained from the Institute for Artificial Insemination (BIB) Singosari Malang. Decrease in motility and viability without extender were higher (P <0.01) compared with extender. Motility of spermatozoa decreased to 10% at 12 hours without diluent. While the decrease in motility with diluent was 10% at 24 hours. It is also demonstrated motility of 0% at 96 hours without diluent while the semen with extender had 12.3 ± 2.16%. Also on the viability, the reduction reached 20% in diluent usage at 9 hours and without diluent at 3 hours. Decrease in motility and viability without diluent were higher (P <0.01) compared with diluent. Motility of spermatozoa decreased to 10% at 6 hours without diluent. While motility with diluent decreased 6% at 6 hours. It is also demonstrated motility 1% at 42 hours without the diluent while the semen with diluent had 14.5 ± 0.53%. Also on the viability, on the reduction reached 20% in the use of diluent at 15 and 57 hours without diluent, 0% viability while the diluent at 57 hours was 31.171±0.37%. Abnormality in six hours without a diluent has shown a decrease of 20% whereas the diluent is still down 15%. The conclusion of this study is the quality of spermatozoa in the storage temperature 5^oC higher than storage at room temperature. The quality of spermatozoa at 5^oC temperature and room temperature with diluent is higher than without diluent.

Key Words: Sperm Quality, Time Storage, Temperature, Fresh Sperm, Diluent

INTRODUCTION

The success of a Artificial Insemination program (AI) in cattle does not only depend on the quality and quantity of sperm ejaculated, but also depends on the ability to maintain the quality and increase the volume of semen for a while longer after ejaculation so that more cows will be inseminated. The effort to maintain the quality of the semen and multiply the results of an ejaculation of male superiority by using some diluents. Terms of each diluents is to provide nutrients for the needs of spermatozoa during storage, should allow the sperm to move progressively, non toxic to sperm, becomes a buffer for the sperm, can protect sperm from cold shock for both frozen semen and semen which is not frozen (liquid semen).

Some problems in dilution and especially semen storage can be solved by taking the path of freezing sperm. But for AI activities that utilize liquid semen due to the absence or scarcity of frozen sperm in an area that has had the same type of superior male used for frozen semen, the dilution and storage will be a problem. Solihati and Peter (2011) reported that diluents Egg Yolk Citrate was more able to maintain the vitality of spermatozoa Simmental cattle up to 4.67 days of storage; Yellow Skim milk-egg for 3.86 days and fresh milk for 4.00 days and the lowest was obtained from coconut water diluents yolk ie 3.33 days after dilution at three storage temperatures - 5^0C. Sperm motility liquid sperm Simmental cattle in this study were still above the motility of at least worthy of

AI, which is 40% only limited storage time the fourth day of the fourth diluents, although a diluents Citrate-Egg Yolk and Milk Fresh-Egg Yolk could still be reached until the fifth day.

Arifiantini and Purwantara (2010) reported that the percentage of motility and viability of semen every 24 hours during 144 hours of storage at a temperature of 5 ° C showed that the decline in motility as much as 4.3% to 8.6% for every 24 hours of observation and a decrease in viability between 5.1% to 5.8%. Yudi et al. (2008) reported that the shelf life of fresh semen based motility and viability, after 3 and 9 hours of storage at room temperature row - succession was 48.33 ± 10, 52 ± 7% and 20.00 , 98%. While on the 5 °C temperature was 41.67 ± 8.88% and 12.92 ± 7.22%. Meanwhile, the viability of the same retention time was 71.49 ± 6.32% and 50.40 ± 7.3% at room temperature and 65.82 ± 6.68% and 41.07 ± 8.34% at a temperature 5 °C. Differences in motility and viability, were significant (P <0.05) between the storage at room temperature and a temperature of 5 °C can be seen after 3 hours. Semen stored at a temperature of 5 °C showed a decrease in motility and viability faster than the sperm stored at room temperature. So that at any observation sperm stored at room temperature showed motility and viability was significantly higher. Based on this background it is necessary to know the quality of fresh semen bulls at 5 °C and room temperature storage with a long shelf by using different diluents.

Currently there is no standard on the long shelf use fresh semen at a temperature of 5 °C and room temperature that are still able to guarantee the quality of fresh sperm so that it can be processed further. Aim of this research is how the quality of fresh sperm bulls at the storage temperature of 5°C and with a long shelf space and the use of different diluents. So it is necessary to study the quality of fresh semen of bulls at the storage temperature of 5 ° C and with a long shelf space and the use of different diluents. Based on the research results Yudi, et al (2008) showed that the semen stored at a temperature of 5 °C showed a decrease in motility and viability faster than the sperm stored at room temperature. In this study, treatment was added by the use of diluent. So sperm stored at a temperature of 5 °C showed a decrease in motility and viability faster than the semen stored at room temperature by using diluent than those without diluent.

MATERIALS AND METHODS

Research material used is fresh bulls semen were obtained from the Institute for Artificial Insemination (BIB) Singosari Malang.

The research method used is laboratory research using completely randomized design (CRD) factorial. This study was carried out to determine the quality of spermatozoa fresh semen in storage at room temperature and 5 ° C, with the use of diluents and without diluents on a long shelf 0, 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, 63, 66, 69, 72, 75, 78, 81, 84, 87, 90, 93, 96 hours, each repeated 10x. The variables measured were: motility, viability and sperm abnormalities. Data were analyzed using factorial completely randomized design. If the treatments show significant effect then continued with Least Significant Difference test.

RESULTS AND DISCUSSION

Fresh Semen Quality

Examination of fresh semen in the study includes volume, color, concentration, mass motility, individual motility, percentage of survival, abnormal spermatozoa which can be seen in Table 1.

The quality of the fresh semen on the research showed that the semen could be used for further processing. The percentage of fresh semen motility Limousin beef obtained from microscopic examination was 70% at a concentration of 1333 million spermatozoa / ml. The percentage of fresh semen motility and concentration that meets the requirements for further processing, as a minimum percentage of motility and concentration produced must be 70% and not less than 500 million spermatozoa / ml (Zenichiro, et al, 2002). Further Hafez and Hafez (2008) states that fresh

spermatozoa used must have motility percentage of more than 50% with a concentration of more than 500 million spermatozoa / ml. The percentage of fresh semen motility in this study was higher. According to Susilawati (2005) semen had a motility percentage over 70% more than when survival is lower than 70%. Examination of the concentration needs to be done. The concentration of spermatozoa could be used to predict the fertility of bulls. The percentage of fresh semen abnormality of 3% indicates that fresh semen could be used to process more feasible because, according to Hafez and Hafez (2008) spermatozoa abnormalities should not exceed 20%. The quality of the fresh semen used in this study is the semen that has good quality.

Table 1. Quality of fresh semen

Examination	Mean
Volume (ml)	12.8 ml
Color	white
pH	6.4
Mass motility	++
Individual motility (%)	70%
Concentration (million / ml)	1333
Viability (%)	93%
Abnormalities (%)	3%

The results showed that the longer the storage of spermatozoa at a temperature of 5 °C, the motility and viability will fall, where the motility and viability of spermatozoa without dilution showed a higher decrease ($P < 0.01$) than the motility and viability with the diluent. It was followed by the increase in sperm abnormalities in semen without diluent wherein abnormality was higher ($P < 0.01$) than the abnormality with the diluent. Quality of spermatozoa at different time intervals and use of diluent also showed a very significant difference ($P < 0.01$).Decrease in motility and viability without diluent was higher ($P < 0.01$) compared to semen with diluent . Sperm motility decreased to 10% at the 12 hours period without diluent. While by diluting a 10% decrease was observed on a long shelf 24 hours. It was also observed motility 0% 96 hours without diluent while with diluent it was 12.3 ± 2.16%. Likewise in viability, the reduction reached 20% with the use of diluents with a long shelf of 9 hours and without diluting in 3 hours.

Motility of sperm ranged between 40-75% (Garner and Hafez, 2008). Indonesian National Standard (SNI) requires that a qualified semen used in the IB program must have a minimum percentage of motile spermatozoa 40%. The existence of a highly significant difference ($P < 0.01$) in the old store spermatozoa using diluents on percentage motility associated with the supplies the nutrients needed by the spermatozoa to acquire the energy used to support the movement. Supplies nutrients derived spermatozoa of diluent used in this study. the longer the storage time, means that the energy required decreased because due to the nutrients that are available already on the wane. Temperature adjustment to 5^0C temperature can also affect the movement since the sperm must be able to adjust the physical condition of the environment.

Percentage viability of fresh semen of normal cow by 60 – 80% (Hafez, 2008; Kusumawati, et al., 2007). The optimum temperature for the survival of spermatozoa is 37-38^{o}C (Zenichiro, et al, 2002). Therefore, when the ambient temperature below the optimum temperature for life then the spermatozoa will be under pressure (cold shock). The longer the storage time the pressure faced by spermatozoa will also be greater.

To survive spermatozoa requires a constant supply of nutrients as an energy source. Nutrition of spermatozoa derived from a diluent which has the substance or substances required by spermatozoa which is a food source for them, among others, such as fructose, lactose, raffinose, amino acids and vitamins in the yolk so that spermatozoa can obtain energy resources in sufficient quantities for the motility. Reported by Tambing et al (2003) the longer the old store at a

temperature of 5^0C, the intake of nutrients derived from diluents diminishing this reduction will affect energy to power live spermatozoa.

The temperature can kill sperm because the longer the storage time when the supply of nutrients and automatically the less energy that is used by fewer and fewer spermatozoa and if the time is longer sperm will die. Supplies nutrients derived spermatozoa of diluents used in this study. The longer the storage time, means decreasing the energy required because due to nutrients available already on the wane.

The longer sperm storage at room temperature, the motility and viability will fall where the motility and viability of spermatozoa without dilution showed a higher decrease ($P < 0.01$) than the motility and viability with the diluent. It was followed by the increase in sperm abnormalities in spermatozoa without diluent wherein abnormality was higher ($P < 0.01$) than the abnormality with the diluent. Quality of spermatozoa at different time savings and use of diluent also showed a very highly significant ($P < 0.01$). A decrease in motility and viability without diluent higher ($P < 0.01$) compared with diluent motility. Sperm motility decreased to 10% at 6 hours long shelf without diluent. While by diluting a decrease of 6% on a long shelf 6 hours. It is also indicated motility 1% with long shelf 42 hours without diluent while with the diluent it was 14.5 ± 0.53%. Likewise on the viability, the reduction reached 20% with use of diluent and without diluent with a long shelf 15 hour with diluent by long shelf 57 hours without diluent, viability showed 0% while the old store diluent with 57 hours still 31.171 ± 0.37%. Abnormalities in the old store 6 hours without diluent has shown a decrease of 20%, while the diluents is still down 15%.

Motility of sperm ranges between 40-75% (Garner and Hafez, 2008). Indonesian National Standard (SNI) requires that a qualified semen used in the IB program must have a minimum percentage of motile spermatozoa 40% (Anonymous, 2010). The existence of a highly significant difference ($P < 0.01$) in the old store spermatozoa using thinners on percentage motility associated with the supplies the nutrients needed by the spermatozoa to acquire the energy used to support the movement. Supplies nutrients derived spermatozoa of diluents used in this study. The longer storage time, means that the energy required decreased because due to the nutrients that is available already on the wane. Temperature adjustment factor of livestock body temperature to room temperature can also affect the movement since the sperm must be able to adjust the physical condition of the environment.

The temperature can kill sperm because the longer the storage time when the supply of nutrients and automatically the less energy that is generated by fewer and fewer spermatozoa and if the longer sperm will die. Supplies nutrients derived spermatozoa of diluents used in this study. The longer the storage time, means decreasing the energy required because due to nutrients available already on the wane. Percentage of life (viability) of fresh semen normal cow by 60-80% (Repitition) (Hafez, 2008). The optimum temperature for the survival of spermatozoa is 37-38^{o}C (Zenichiro, et al, 2002). Therefore, when the ambient temperature below the optimum temperature for life then the spermatozoa will be under pressure (cold shock). The longer the storage time the pressure faced by spermatozoa will also be greater.

To survive spermatozoa requires a constant supply of nutrients as an energy source. Nutrition spermatozoa derived from a diluents which has the substance or substances required by spermatozoa which is a food source for him, among others, such as fructose, lactose, raffinose, amino acids and vitamins in the yolk so that spermatozoa can obtain energy resources in sufficient quantities for the motility.

Processing techniques, including diluent and dilution rate, and the type of carbohydrate as carbohydrates as an energy source in the media as well as protective spermatozoa (anti-cold shock) becomes important, because it will affect the quality (Hafez and Hafez, 2008). According to the research Yudi, et al. (2008) that the characteristics of the fresh semen is still quite good with notilitas at 3 and 12 hours after storage at room temperature was 48.33% and 10.42%

CONCLUSION

Quality of spermatozoa at 5 °C temperature storage was higher than storage at room temperature. Quality of spermatozoa at a temperature of 5 °C and room temperature by diluting was higher than without diluent. Longer storage, quality of sperm was declining either with or without diluent at a temperature of 5 °C and room temperature.

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Spermatozoa Viability of Filial Ettawa Goat After Sexing Process

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ABSTRACT

The use of albumin derived from egg white is a method that is easy to apply, cheap, effective for sexing semen process of separating the spermatozoa X and Y. The viability of Filial Ettawa goat spermatozoa after the sexing process using different percentages of albumin density egg white with coconut water diluent and egg yolk diluents was examined. The egg white albumin density treatments were 3 gradients of 10%, 30% and 50%. Laboratory experiments were performed sexing spermatozoa using the 3 density gradients of egg white albumin with coconut water diluent and egg yolks diluents with a 20 minute incubation time. Each treatment was replicated 10 times. Data was statistically analyzed using analysis of variance model (ANOVA). The addition of coconut water diluent and egg yolk diluent provide a highly significant difference ($p<0.01$) in the spermatozoa separation of the top and bottom layers, but the average value there is no significant difference. The spermatozoa viability after sperm sexing found that using density gradient egg whites showed better results using egg yolk diluent compared to coconut water diluent. The top layer had a mean percent live sperm of 78.52 ± 8.65% and the bottom layer had mean percent live sperm of 80.29 ± 8.735%. Further research is needed into the quality of spermatozoa sexing results using varying gradients of egg whites.

Key Words: Sexing, Egg White Albumin Density, Diluent, Egg Yolk, Goat

INTRODUCTION

There are many technological developments in the field of animal reproduction that continue to improve the productivity of livestock that have great potential in the supply of meat. To improve and maintain the potential of livestock capable of providing high meat yields developments in the field of animal reproduction technology for example the separation of chromosomes X and Y sperm cells often called sexing spermatozoa, can produce descendants with gender-matched expectations later. Dairy cattle produce female animals, whereas livestock produce male animals. Mechanical separation of X and Y sperm cells can be done in various ways using various materials. Experiments are often done partly by using a density gradient method of egg white albumin, percoll density gradient centrifugation, filtration with sephadex column method, hormonal manipulation, HY antigens, isoelectric focusing, electrophoresis and separation of the difference in charge Deoxyribo nucleic acid (DNA) (Hafez, 2008; de Jonge, et al., 1997).

Bianchi (1991) and Graves (1994) noted that the sex of progeny born by female stud animals, is determined by sperm cell chromosomes X and Y. Each of these cells carries DNA structure and information in distinguishing male and female sexes. X chromosome sperm cells will produce a female embryo whereas the Y chromosome will produce a male embryo. The Y chromosome has a sex Determining region Y (SRY) gene that determines the formation of the testes in male animals. The determining region Y (SRY) is not in the X chromosome sperm cells allowing sperm sexing to occur using ingredients derived from egg white albumin. The use of albumin is a method that is easy to perform and cheap.

According to Solihati, et al. (2013), diluents of young coconut water plus egg yolk are able to ensure sperm survivale after dilution for 3.33 days at a storage temperature between 3 and 5^0C. While the use of 75% egg yolk citrate + 25% coconut water provides the lowest abnormalities (12.42%), the highest percentage of survival (79.89%) and the highest intact plasma membrane (60.81%) and the longest survival period (10, 91 days) compared with 100% diluent and diluent citrate egg yolk egg yolk citrate 75% and 25% old coconut water (Romaranti, 2007). According to Pamungkas, et al. (2013) results after sexing spermatozoa stored at 5°C for 6 days, showed motility differences between treatment dilution level balance of tris aminomethane egg yolks with the semen (1:0.5) by 53 ml, 75% motility in the upper fraction was higher ($p<0.05$) compared to treatment 1:1 (46.25%) and 1:1.5 (45.0%). An incubation time of 20 minutes resulted in the top fraction X spermatozoa proportions of 69.80 ± 3.94% with 50.50 ± 5.51% motilityand a percentage of live semen at 67.92 ± 11.17%.

The aim of this study is to determine the viability of goat spermatozoa after the sexing process using albumin density egg white with coconut water diluent oil and egg yolks, with the percentage of egg white albumin density used in 3 gradients of 10%. 30%, and 50%.

MATERIALS AND METHODS

This research was carried out in an integrated laboratory at the Faculty of Animal Husbandry Kanjuruhan Malang in April 2015. The material used for this study is the fresh goat semen, albumin and coconut water. The laboratory experiments were performed at different density gradients for sexing spermatozoa using egg white albumin with coconut water diluent and egg yolks with a time of incubation of 20 minutes, each treatment was repeated 10 times. The 3 gradient percentages of egg white albumin density used were 10%, 30%, and 50%. Spermatozoa viability was then observed only the 20 minute incubation. Data was statistically analyzed using the analysis of variance.

RESULTS AND DISCUSSION

Fresh Semen Quality

Table 1. Results of the examination sperm used in research

Parameter	(X±SD)
Volume	2.20 ± 1.29
Colour	white
pH	6.4 ± 0
Mass motility	++
Individual motility (%)	70 ± 0
Concentration (million/ml)	1352.20 ± 173.90
Viability (%)	86.81 ± 5.75
Abnormalities (%)	5.95 ± 2.01
Motile spermatozoa	946.54 ± 121.73

The quality of the sperm in the fresh semen has shown that the use of cement is feasible for sexing semen. The percentage of sperm motility in fresh goat semen obtained from microscopic examination was 70% at a concentration of 1352.20 ± 173.90 million spermatozoa/ml. This percentage of motile sperm and semen concentration meets the requirement for semen sexing. A minimum percent motile sperm and semen concentration for sexing is greater than 70% and not less than 500 million spermatozoa/ml (Zenichiro, et al, 2002). Hafez (2008) states that fresh spermatozoa used for sexing must have percent motile sperm of more than 50% with a concentration of more than 500 million spermatozoa/ml. In addition to these studies Susilawati (2001) stated that percent

motile sperm over 70% the survival rate is greater than when motility is lower than 70%. The motility percentage of fresh semen in this study is high.

Examination of the concentration of spermatozoa can be used to predict fertility of rams. The percentage of fresh semen abnormalities of 5.95 ± 2.01% indicates that the fresh semen processed was of sufficient quality. According to Hafez (2008) spermatozoa abnormalities may not exceed 20%. The fresh cement used in this study was good quality. The percentage of goat spermatozoa was better when the concentration was 75 million of sperm/straw than when the concentration was 50 million of sperm/straw or 25 million of sperm/straw. The highest percentage of live spermatozoa in this research occurred when the concentration was 75 million of sperm/straw.

The addition of diluents of coconut water and egg yolk showed a highly significant difference ($p<0.01$) in the percentage of spermatozoa separation of the top layer. Egg yolk diluent had a larger amount of separation in the top and bottom layer than the coconut water diluent. The average of the percentage of live spermatozoa after the top and bottom layer separation decreased from the average percentage of live spermatozoa in the fresh cement. The top layer had a mean percent live sperm of 78.52 ± 8.65% and the bottom layer had mean percent live sperm of 80.29 ± 8735%. The decrease in the percentage of live spermatozoa after separation can be caused by the disconnection of spermatozoa from seminal plasma. Seminal plasma can serve as a source of energy for the spermatozoa. If the energy supply is limited it is likely to disturb the viability of spermatozoa. According to Susilawati (2003) seminal plasma that typically contains citric acid, ergotionine, fructose, phosphorylcholine glysery and sorbitol. Fructose is utilised in the sperm metabolism process is useful as a source of energy.

Spermatozoa vitality depends on the integrity of the membrane. According to Susilawati (2000) the separation of spermatozoa by centrifugation resulted in damage to the structure of the sperm membrane. Spermatozoa membrane damage results in the disruption of intracellular metabolic processes

CONCLUSION

Semen quality after spermatozoa sexing using density gradient egg whites showed better results using egg yolk diluent compared coconut water diluent for goat semen.

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Performance of Kampong Chicken Fed Rations With Suplementing Dry Carboxylate Salt Mixture (DCM) or Coconut Oil Hydrolisate (COH)

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ABSTRACT

The experiment aimed to know effect of supplementing dry carboxylate salt mixture (DCM) or coconut oil hydrolisate (COH) on kampong chicken performance. The experiment used DOC which is divided to is 75 units henhouse with 3 treatments and 5 replications. Each unit consist of 5 DOC and fed treatments during 8 weeks. The treatments were T_1 (commercial ration = BP-1), T_2 (T_1 + 3% DCM), and T_3 (T_1 + 3% COH). The variables were daily feed intake, weekly gain, feed conversion, carcass weight, gizzard weight, liver weight, and heart weight. The data analysis used ANOVA and orthogonal contrast test. The results showed that daily feed intake (g/d), T_1 = 53.52 ± 3.00^a, T_2 = 38.86 ± 5.12^b, T_3 = 50.72 ± 6.41^a, weekly gain (g/week) T_1 = 17.41 ± 4.80, T_2 = 18.89 ± 2.77, T_3 = 16.22 ± 1.22, T_3 = 10.72 ± 6.41, feed conversion T_1 = 6.11 ± 1.24, T_2 = 3.92 ± 1.06, T_3 = 5.71 ± 1.09, carcass weight (kg) T_1 = 75 ± 19.33^c, T_2 = 345.50 ± 19.33^b, T_3 = 377.0 ± 10.55^a, gizzard weight (g) T_1 = 10.75 ± 0.5, T_2 = 12.13 ± 0.25, T_3 = 13.13 ± 0.25, liver weight T_1 = 10.6 ± 0.81, T_2 = 13.1 ± 0.05, T_3 = 16.63 ± 0.48, heart weight T_1 = 2.4 ± 0.25, T_2 = 3.3 ± 0.29, T_3 = 4.0 ± 0.41. It can be concluded that (1) supplementing 3% dry carboxylate salt mixture (DCM in the ration improve weekly gain and feed conversion ; (2) supplementing 3% coconut oil hydrolisate (COH) in the ration improve carcass weight, gizzard weight, liver weight, and heart weight.

Key Words: Dry Carboxylate Salt Mixture (DCM), Coconut Oil Hydrolisate (COH), Kampoeng Chicken, Performance

INTRODUCTION

The population and demand of kampoeng chicken meat increased each years. From 2001 to 2005 meat consumption from kampoeng chicken increased 1.49 million to 1.52 million ton in Indonesia (Aman, 2011). These phenomena need feed supply that support to increased kampoeng chicken productivity.

The increasing animal productivity could increased via improving feed quality as protected fatty acids supplementing. And then, supplementing dry carboxylate salt mixture (DCM) or dry methyl ester mixture (DMM) as results of fish oil processing in ration for dairy cattle lactating could improved fatty acids profile and cattle milk yield (Tasse, 2010). These phenomena was supported by Yurleni *et al*., (2013) that supplementing DCM in ration improved meat quality and body weight gain (BWG) swamp buffaloes.

Feed quality improving via introducing feed supplement was one of way that many working by researchers. But, introducing protected fatty acids in ration for chicken especially kampoeng chicken have not many publish in the journal. Based on these arguments, the experiment has been conducted to see effect of dry carboxylate salt mixed (DCM) and coconut oil hydrolysate (COH) on kampoeng chicken performances.

MATERIAL AND METHOD

The experiment has been conducted during 3 months at Laboratory of Nutrition and Feed Technology, Faculty of Animal Science, University Halu Oleo, Kendari.

Materials

Seventy five DOC kampoeng chicken divided into litter cages 1 m x 1 m x 0.6 m with feed and water drink plates. Each unit consist of 5 DOC and fed treatments during 8 weeks. The treatment were T_1 (commercial ration),
T_2 (T_1 + 3 % DCM), and T_3 (T_1 + 3 % COH).

Making Dry Carboxylate Salt Mixed (DCM)

Making DCM

Method of making DCM was result of modificate Tasse (2010). Principles of DCM was hydrolysis of fish oil with acid (HCl) and base (NaOH). Fish oil from fish waste (head, tail, viscera, pin, bone). After cooking, fish oil was mixed with *Spondicus sp* leaf solution and sagoo meal. This mixture was dried in the oven with temperature 60 °C.

Making Coconut Oil Hydrolisate (COH)

Method of COH was modificate Tasse (2010). Principle of DCM was hydrolysis fish oil with sodium hydroxide and calcium chloride. This mixture was added sagoo meal. Then was dried in the oven with temperature 60 °C.

Ration

Commercial Ration was used control Ration was used to experiment consist of,
T_1 = Control (commercial ration)
T_2 = T_1 + 3 % DCM
T_3 = T_1 + 3 % COH

Table 1. Chemical Composition of Experimental Rations

Nutrient Contests	T_1	T_2	T_3
Moisture (%)	6.01	8.05	10.04
Crude Protein (%)	14.89	16.34	15.90
Ether extract (%)	1.60	2.11	2.20
Crude fiber (%)	1.80	1.12	1.00
Ca	0.8	1.0	1.0
P	0.3	0.4	0.5

Experimental Design and Data Analysis

Experimental design in this experiment used a completely randomized design 3 x 5, 3 treatment with 5 replications. The experimental variables were daily feed intake (g), weekly gain (g), feed conversion, carcass weight (g), gizzard weight (g), liver weight (g), heart weight (g).

The data obtained were analyzed using analysis of the range. If there was significant difference ($P < 0.05$), followed by Contrast Orthogonal (Steel Torrie, 1991).

RESULT AND DISCUSSION

Kampoeng Chicken Performance

The initial live weight indicated that DOC were distributed well within the experimental treatments. There was no difference on daily gain, but there were difference on daily, feed intake, feed conversion, carcass weight, gizzard weight, liver weight, and heart weight.

Table 2. Performance and Viscera Weight

Observed variable	Treatment		
	T_1	T_2	T_3
Performance			
Daily feed intake (g)	53.52 ± 3.0[a]	38.86 ± 5.12[b]	50.72 ± 6.41[a]
Weekly gain (g)	17.41 ± 4.80	18.84 ± 2.77	16.12 ± 1.22
Feed conversion	6.11 ± 1.34[a]	3.93 ± 1.06[c]	5.71 ± 1.09[b]
Carcass weight (g)	266.75 ± 19.33[b]	345.50 ± 19.33[a]	377.0 ± 10.5[a]
Viscera			
Gizzard weight (g)	10.75 ± 0.5[c]	12.13 ± 0.25[b]	13.12 ± 0.25[a]
Liver weight (g)	10.6 ± 0.81[c]	13.15 ± 0.05[b]	16.69 ± 0.48[a]
Heart weight (g)	3.4 ± 0.25[b]	3.3 ± 0.29[c]	4.0 ± 0.41[a]

Means in the same raw with different superscript differ significantly ($P < 0.05$)

Daily feed intake (DFI) of T_2 was lower then T_1 and T_3, but T_1 same as T_3 (Table 2). It indicated that T_2 consist of energy higher then T_1 and T_3. And then level of energy in the T_2 enough energy requirement kampoeng chicken feed conversion of T_2 lower than T_1 and T_3. It indicated that the decreasing feed intake was not follow by increasing body weight gain, would result efficiently feed conversion ratio (FER). And then the phenomena indicated that T_2 content energy higher than T_1 and T_3. Although, T_2 is lowest on feed in take but it is highest on feed conversion.

Daily gain (DG) of T_2 and T_3 were higher then T_1. It indicated T_2 and T_3 content that enough requirement of energy so could supported muscle cells mitosis the increasing of numbers of cells was indicated by daily gain.

Supplementing DCM and COH resulted DFI mean in the range about 38.86 – 50.72 g. The result of this experiment higher than Aziana (2005) that range of DMI about 37.93 – 39.53 g on kampoeng chicken starter phase, but it is more lower than Gunawan and Sulandari (2003) that 64.42 g.

Supplementing DCM and COH resulted gain mean in the range about 16.22 – 18.89 g. The results of this experiment higher than Aziana (2005) that range of gain about 9.17 – 12.94 g.

Carcass weight of T_2 and T_3 higher than T_1 (Table 2), the effect of T_2 and T_3 was same on daily gain and carcass weight. There indicated taht increasing of was followed by cats weight on kampoeng chicken. Range of carcass weight was about 266.75 – 377.00 g during 6 weeks fed DCM and COH. Nashahon et al., (2005) reported that carcass weight was depended with live body weight (LBW). Sumarna (2000) also reported that body weight of kampoeng chicken at markets about 0.7 – 1.0 kg.

Range of heart weight (HW) was about 2.4 – 4.0 g or HW percentage was about 0.51 – 0.62 %. Lathivah (2012) reported that HW percentage was about 0.50 – 1.42 % from live body weight.

Range of liver weight (LW) was 10.56 – 16.69 g LW percentage about 2.26 – 2.57 %. Arief (2005) reported that LW percentage normally about 2.10 – 2.54 %. Range of GW about 10.75 -13.33 g or GW was percentage about 2.03 – 2.30 %. Putnam (1991) reported that GW percentage normally about 1.6 – 2.3 %.

Gizzard weight (GW), liver weight (LW), and heart weight (HW) included in viscera. GW and LW of T_3 was higher than T_1 and T_2, and T_2 was higher than T1 contrasly, T1 higher than T_2 on HW kampoeng chicken. These indicated that digestion processing activities on kampoeng chicken with feed T_3 (COH) higher than T_1 and T_2, and also detoxification process activiticies of T_3 higher than T_1 and T_2.

CONCLUSION

Supplementing 3% dry carboxylate salt mixture (DCM) in the ration improved feed conversion, carcass weight and liver weight. Supplementing 3 % coconut oil hydrolisate (COH) improved carcass weight, gizzard weight, and liver weight.

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Provision of Multi-Nutrient Block for Local Goats: Effects on Physico-Chemical Properties of Goat Milk

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ABSTRACT

Farmers in Enrekang, South Sulawesi typically feed their goats with *Gliricidia maculuta* as a sole diet. This may cause a problem due to asynchrony of nutrient availability in the rumen, especially the availability of energy and protein, which could lead to poor milk yield in terms of quantity and quality. The purpose of this research was to study the effect of providing multi-nutrient block (MNB) on the physical and chemical characteristics of goat milk. Ten Ettawa crossbred goats on the 3rd-4th month of their lactating period were randomly divided into two groups (five goats/group). Each group was either fed on *Gliricidia maculata*/control (ration C, a ration typically used by Enrekang farmers for feeding their goats) or fed on C + MNB (CM). MNB was formulated from locally available feedstuff and was provided at the level of approximately 500 g/head/d. The results of the study showed that provision of MNB did not significantly (P>0.05) improve milk yield, i.e. 198 and 274 ml/d for C and CM, respectively. The treatment did not significantly (P>0.05) affect physical characteristics, i.e. pH and specific gravity of the milk. Similarly, provision of MNB did not significantly (P>0.05) alter chemical composition, i.e. total solids, crude protein, fat, carbohydrate, lactose, mineral, Ca, and P of the milk. In conclusion, there was no significant benefit on providing multi-nutrient block for goats consuming *Gliricidia maculuta* as a sole diet in terms of physical and chemical properties of the milk, but there was a tendency that provision of MNB may improve yield, crude protein and fat of goat milk.

Key Words: Multi-Nutrient Block, Protein of Goat Milk, Fat of Goat Milk, Total Solids of Goat Milk, Gliricidia maculata

INTRODUCTION

Milk is one of very important foods in the human diet. Milk serves as animal protein source, which is rich in nutritive components, such as protein, fat, carbohydrate, ash, calcium, and vitamins, as well as complete amino acid and fatty acid compositions. Similar to cow milk, the goat milk has been considered as a high quality food. Many factors have been reported to affect milk yield and milk compositions. Among others are breed (Ako, 2012), feeding (Andrade and Schmidely, 2006; Utari et al., 2012; Ramadhan et al., 2013); period of lactation (Bhosale et al., 2009; Strzakowska et al., 2009; Wibowo et al., 2013), management (Rangkuti, 2011; Ako, 2012), and environment (Mutamimah et al., 2013).

Management system is one factor that could affect the yield and the chemical properties of the milk. In Enrekang District, farmers usually feed their goats with *Gliricidia maculata,* a legume shrub, as the only diet for their animal. The farmers of Enrekang have been practicing this type of feeding management for a long time. Even though this feedstuff can be categorized as a good quality diet, which is characterized by its high digestibility and high crude protein content(Chadokar, 1982; Speedy and Pugliese, 1992; Toum et al., 2004; Winugroho and Widiawati, 2009; Islamiyati et al 2013), availability of energy and protein from this particular diet in the rumen is not synchronized due to high and very rapid protein degradation rate, which, in turn, could affect optimum rumen

fermentation (Natsir, 2004).Winugroho and Widiastuti(2009) reported only 24-30% of protein of leucana and gliricidia can be utilized by the sheep, most of the protein is degraded in the rumen and lost through the urine. It is therefore important to provide some nutrients, especially energy source feedstuff, to balance the availability of protein of *Gliricidia maculata*. Synchronization of energy and protein availability in the rumen is an important factor optimizes rumen fermentation system (Andrade and Schmidely, 2006; Natsir, 2004, 2012).

Provision of multi-nutrient block (MNB), a feed supplement formulated from locally available feedstuff, is important to correct the nutrient problem for the goats in Enrekang.It is a good strategy for meeting all essential nutrients required by dairy goats for optimum milk production. The benefits of giving MNB to the goats can be seen not only from the aspect of meeting the nutrient requirements of the animal but also from the aspect of optimizing the utilization of agricultural by-products and agro-industry, which are abundantly available in the area. Syamsu *et al* (2003, 2006) reported that South Sulawesi has a high potential in agricultural by-product and agro-industry waste that can be utilized to support ruminant production, including goats. Therefore, this experiment was designed to study the impact of providing MNB on top of the basal diet (*Gliricidia maculata*) on the physical and chemical properties of goat milk in Enrekang District, South Sulawesi.

MATERIALS AND METHODS

Treatment Diet and Experimental Design

Ten dairy goats in the 3rd-4th monthof lactation period, with an average body weight of approximately 40 kg,were randomly assigned into two groups (five goats/group). Each group was either fed on *Gliricidia maculata/*control diet = C (diet typically used by the local farmers in Enrekang)or fed on control feed + multi-nutrient block (CM). Multi-nutrient block (MNB) used in this study was sourced from locally available feedstuff and prepared in the Laboratory of Feed Industry, Faculty of Animal Science, Hasanuddin University. MNB was formulated to contain crude protein content around 20%. *Gliricidia maculata*was offered *ad libitum* while MNB was provided at the level of 500 g/head/d. The composition of MNB is presented in Table 1, while chemical composition of *Gliricidia maculata* and MNB is presented in Table 2. Throughout the study, each animal had free access to drinking water.

Table 1. Feedstuff composition of multi nutrient block

Ingredients	Composition (%)
Molasses	40
Urea	2.5
Rice brand	20
Copra meal	15
Corn ears	10
Fish meal	5.5
Mineral	2
Salt	1
Cement	4
Total	100

Sampling

All animals were fed on the experimental diet for one month before taking samples. Daily feed intake was measured for five consecutive days. Feed samples (*Gliricidia maculata* and MNB) were subjected to laboratory analysis during the sampling period. Feed consumption was calculated by substracting the amount of feed offered from the orts. Similarly, milk production was measured for five consecutive days during the sampling period. Each animal was milked once a day in the morning.

Individual milk sample was placed in a marked container and put in an ice box before this was brought to Makassar for laboratory analysis.

Table 2. Chemical composition of feedstuff used in the experiment*

Nutrients (g/kg DM)	***Gliricidia maculata***	**MNB**
Dry matter	224.2	830.5
Crude protein	208.6	196.3
Ether extract	49.4	42.4
Crud fibre	195.9	63.4
Nitrogen free extract	446.6	541.6
Minerals	99.5	156.3
Neutral Detergent Fiber	346.1	249.6
Acid Detergent Fiber	186.1	144.0
Hemicelluloses	155.5	105.6
Cellulose	129.0	96.8
Lignin	48.3	38.0

MNB = Multi-nutrient block
*The Feed Chemical Laboratory , Faculty of Animal Science, Hasanuddin University, 2014.

Chemical Analysis

Chemical composition of diet (*Gliricidia maculata* and MNB) was determined for dry matter, organic matter, crude protein, crude fibre, ether extract, nitrogen-free extract, and mineral (AOAC, 2000). The diets were also analyzed for fibre composition: neutral detergent fiber (NDF), acid detergent fiber (ADF) and lignin (Goering and Van Soest, 1970). With regard to physical properties, the milk was analyzed for pH and specific gravity, while chemical composition of the goat milk was determined for total solids, crude protein, fat, carbohydrates, lactose, ash, calcium, and phosphorus (AOAC, 2000).

Parameters and Data Analysis

Parameters measured inthis experimentincluded milk yield; physical properties of the milk, i.e. pH and specific gravity; and chemical properties of the milk, i.e. total solids, protein, fat, carbohydrate, lactose, mineral, calcium, and phosphor. All data were analysed using t-test for two means with assumption of unequal variances for both groups (Sudjana, 2005).

RESULTS AND DISCUSSION

The goats were in good condition throughout the study. As feed intake has been recognized as one factor affecting milk yield and milk composition, the rate of nutrient intake was measured in addition to milk properties parameters. Nutrient intake depends on several factors, i.e. type of diets, nutrient concentration and palatability. Dry matter intake of dairy goats in this study was 1,578 and 1,753 g/d for C and CM, respectively, or around 3.9% and 4.4% of BW. In this study, the average feed intake, when it was expressed in relation to their body weight, was still in the normal range for feed consumption of goats, namely, between 2% and4% of BW (Ako, 2012). High palatability of the diet is probabaly one reason why the intake is quitehigh (Parakkasi, 1999; Natsir, 2012). Intake for some other nutrients, i.e. crude protein, neutral detergent fibreand acid detergent fibre was 329, 539and 294 g/d for ration C and 361, 563, and 310 g/d for CM, respectively. Analysis of variances indicated no significant difference in nutrient intakes for both groups. Even though that there was no significant difference in feed intake between both groups, there was a tendency that the goats consuming ration CM had more nutrient intakes. This is can be understood as the provision of MNB

increased the total intake for the whole ration compared with the feed intake of the goats consuming only *Gliricidia maculata* (ration C).Positive associative effect could be observed in this experiment in which provision of energy sources on protein feedstuff source increases the total intake of the ration (Natsir, 2004).

Table 3. Nutrient intakesof each treatment diet

Parameters	**Ration C**	**Ration CM**
	----------g/d----------	
Dry matter	1,578	1,753
Crude protein	329	361
NDF	539	563
ADF	294	310

Ration C = *Gliricidia maculata*
Ration CM = *Gliricidia maculata*+ Multi-Nutrient Block

With regard to milk production, statistical analysis indicated that there was no significant difference (P>0.05) of milk yield for both treatments, namely 198 ml/d and 274 ml/d for C and CM, respectively. Many factors contribute to the milk yield, such as breed, feeding, period of lactation, environment, and management system (Andrade and Schmidely, 2006; Bhosale et al., 2009; Ako, 2012; Utari et al., 2012; Wibowo et al., 2013; Mutamimah et al., 2013).However, the main reason for low milk yield is due to the period of lactation. In this study, most of the goats used were already entering the third or fourth month of their lactation period. Period of lactation is an important factor determining the milk yield, higher in the early lactation and continuously decreasing to the end of location period (Ako, 2012). Even though statistical analysis indicated that milk yield for both groups was similar, there was a tendency that provision of multi- nutrient block increased milk yield. This is might be related to nutrient intakes, in which the goats consuming ration CM tended to consume more nutrient than that of the control group, ration C (Table 3). High variances of the data might be another factor that contributed to the failure of statistics in determining the difference between both groups.

Table 4. Milk yield, milk physical properties, and milk chemical propertiesfor both treatments

Ccriteria	**Ration C**	**Ration CM**
Milk yield (ml/d)	198	274
Physical properties:		
pH	6.6	6.5
Specific Gravity	1.04	1.04
Chemical properties:		
Total solids (%)	12.77	12.88
Crude protein (%)	3.48	3.81
Fat (%)	3.92	4.62
Carbohydrates (%)	3.67	4.02
Lactose (%)	2.76	3.03
Mineral (%)	0.86	0.85
Calcium (%)	0.16	0.15
Phosphor (%)	0.10	0.10

Ration C = *Gliricidia maculate;* Ration CM = *Gliricidia maculata*+ Multi-Nutrient Block

In terms of milk quality (physical and chemical properties), provision of multi-nutrient block on top of the basal diet did not significantly (P>0.05) alter the physical and chemical composition of the milk (Table 4). The milk pH and milk specific gravity of both treatmentswere not different. Similarly, chemical milk components, i.e. crude protein, fat, carbohydrates, lactose, mineral, calcium and phosphorus of both treatmentswere similar. Numerically, however, there was a tendency that crude protein content and fat content of milk obtained from goats given multi-nutrient supplement increased. This is might be related to higher nutrient intakes (crude protein and fibre intakes) of goats in this group.

Tendency of increasing milk protein content of goats receiving MNB is due to an increase of crude protein intake. Moreover, provision of MNB in the ration CM may improve synchrony of energy and protein availability in the rumen that leads to optimum microbial protein synthesis (Andrade and Schmidely, 2006; Natsir 2007), which, in turn, increased microbial protein supply for the host animal (Natsir, 2007). This was supported by the percentage of blood urea plasma (data not shown) of the animal. The concentration of blood urea plasma of goats consuming CM was lower than that of goats consuming ration C, meaning that availability of N from protein degradation of *Gliricidia maculata* in the rumen can be coupled by the availability of energy from the MNB.The results of this study is consistent with the results reported by Sukarini (2006) and Utari *et al* (2012), who stated that addition of protein source feedstuff could increase total solids non-fat and protein of the milk. Even though, milk protein content in this study was lower than that reported by Mutmainnah et al, 2013, who stated that milk protein content of Sapera goat was between 4.45-4.60%. However, in general, protein level of milk reported in this study is still inside the range of protein content reported by Jennes (1980) who reviewed all studies regarding the chemical properties of goat milk published between 1968 and 1979.As what happened with milk protein, there was a tendency that percentage of fat in the milk of goats consuming CM was higher. Increased level of milk fat is related to higher consumption of NDF and ADF. Animals consuming high fiber diet will produce more acetic acid during fermentation of the diet in the rumen. Acetic acid is the precursor for fat synthesis (Ace and Wahyuningsih, 2010; Ramadhan et al., 2013).

CONCLUSION

Provision of multi-nutrient block (MNB) on top of the basal diet (G*liricidia maculata*) did not significantly alter physical and chemical properties of the milk of the local goats. There is a tendency, however, that provision of supplements may improve the crude protein and fat content of the local goat milk.

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Determining The Pattern of Pesticide Residue Contamination and The Improvement of Production, Quality, and Milk Safety of Dairy Cattle with Probiotic-based Lignochloritic Bacteria

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ABSTRACT

Agricultural waste is a substitute for forage as the main feed of dairy cattle, especially during the dry season. The quality of agricultural waste in Indonesia is very low, with the high content of lignocelluloses which limits digestibility of feed. On the other hand, bioaccumulation of pesticides in plants that occurs during lignifications process caused the highest number of residues found in hay and straw that is lower in security as animal feed. The research objective was to determine the pattern of pesticide residue contamination in dairy products and dairy feed, as well as the improvements to the production, quality, and safety of dairy product. The result showed that forage products, concentrates, and milk were detected to contain 6 harmful organochlorin pesticide residues, namely lindane, heptachlor, eldrin, diendrin, aldrin and DDT. The number of aldrin, DDT, and dileldrin in diendrin milk was as high as between 5.76 to 19.2 ppb. The mechanism of contamination patterns of each pesticide differs, and sources of contamination derived from concentrates, forage, and other resources such as drinking water. The application of probiotic-based lignochloritic bacteria 1% of the total concentrate feed has increased milk production 30-50% of control, increasing the average fat content of 4.0% and lower organochlorin residues in milk between 60-100%.

Key Words: Probiotic, Lignochloritic, Pesticide, Residue

INTRODUCTION

Pesticide bioaccumulation in plant occurred during lignifications process so that the highest amount of residue was in straw, and it reduced the level of its safety for cattle feed. Organochlorin pesticide residue was detected in a significantly high level in rice straw waste. Indraningsih et.al. (2003) has reported that even in organic rice straw, the contamination level of DDE and endosulfan were as high as 6.2 and 75.2 ppb although these numbers were not identified in the soil. Pesticide residue was also detected in some cattle consuming corn waste; lindane was present for about 0.25 ppb in cow serum where the cattle were given regular feed from organic farming pattern. Dieldrin and heptachlor were present in cow fat and meat raised from staple food and sugarcane feed. Pesticide was identified as well in cow meat raised by grazing system.

Bioaccumulation of pesticide residue was commonly found in fat tissue of biota. Since the main source of pesticide residue waste is from feed, it is likely that milk from dairy product also contains pesticide residue. A study result by Prihartini, *et.al.* (2007c) showed three lignochlorin isolates that have high potential of lignin and organochlorin degradation interconnections. Isolate potential supports the formation of probiotics for further lignin degradation in order to increase the level of nutrition digestion and detoxification of pesticide residue inside rumen. Furthermore, inoculums formula as the result of this process is considered safe, stable, and effective due to its interconnection characteristic of lignin and organochlorin degradations from isolate. This would guarantee high efficiency in rumen fermentation.

RESEARCH METHOD

Pesticide Residue Profile for Dairy Product and Cattle

This study applied survey method which aimed at showing pattern of pesticide residue contamination of dairy product and feed.

Sampling

Milk samples were derived from 3 milk center areas in Malang regency; they were from Dau, Pujon, and Jabung, each area required 20 cattlemen. Each cattleman should own at least 5 lactating dairy cows. Forage sample and concentrate consumed by cattle was collected by the time the researcher conducted milk sampling. It was expected that this method might help to find out the source of contamination, whether it was from forages or concentrate. Furthermore, by this sampling, the researcher would likely to trace the pattern of pesticide contamination in milk. Milk samplings were conducted on day 3 and 7 after feed sampling, as it was predicted that the effect of cattle feed consumption or rumen fermentation product reached their optimum number by the 3^{rd} and 7^{th} day of consumption.

The sampling for cattlemen utilized purposive sampling by considering area distribution, livestock ownership, types of forages, and concentrates usage. Elephant grass forage type was commonly used by the breeders to feed their dairy cattle and the kind of concentrate used was concentrated milk pap produced by KUD (Village Unit Cooperatives).

Laboratory Analysis

The analysis of milk fat content was measured according to Berger (1970) method. The content measurement of pesticide residues in forages and concentrates as well as milk was carried out according to Ishii *et al.* methods (1994) in the Laboratory of Agricultural Environment, Environmental Research Institute of Agriculture.

Analysis and Statistical Test

The data were analyzed by regression analysis to generate mathematical model of pesticide residue pattern and the effect of pesticide residue contamination of forages and concentrates on milk.

RESULTS AND DICUSSION

Contamination Profile of Pesticide Residue in Feed and Milk

The study results of contamination profile of pesticide residues in forages, concentrates, and dairy products in Malang are presented in Figure 1.2 and 3. Figure 1 shows the six types of organochlorine pesticides detected in elephant grass forage; they are Lindane, Heptachlor, Aldrin, Dieldrin, Endrin and DDT 4.4. Residue content varied; Lindane pesticide was detected on its maximum of 928.4 ppb. Lindane was found in its highest level although in the elephant grass cultivation, farmers did not apply any pesticide. It might happen since the soil and water have been contaminated with pesticide residues from crop farming systems with intensive use of pesticides. In Malang regency, most farmers still use pesticide from lindane and dieldrin types.

Therefore, it could be concluded that soil and water pollutions in farming land in Malang regency was quite high where pesticide residue exists in grass feed although farmers did not use any pesticide in its growing system. Besides, organichlorin residue in forage or straw was not derived from direct usage or contact with pesticide. The residue presented as the result of the long process of metabolism inside the soil, water, as well as air circulated throughout the entire planting processes, thus, the residue lost its original form, structure, and fate (Indraningsih, 2003; Pakdesusuk *et al*., 1998, Glasgen *et al*., 1999).

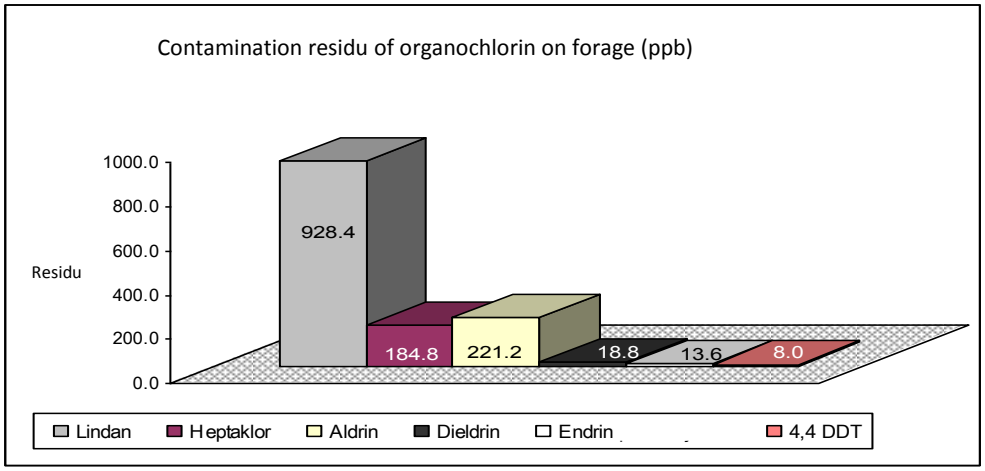

Figure 1. Profile of Pesticide Contamination in Forages

Figure 2 exhibits a very high contamination of 6 types of pesticide residue in concentrate feed. The highest amount of contamination is Heptachlor pesticide as much as 12.30 ppb or 0.06 ppm, exceeding the highest safety limit of food product by Hazzard that is 0.01 ppm. It is in line with Zigterman and Allison (2005)'s assertion that the maximum chlorine residue in food product is 0.001 ppm.

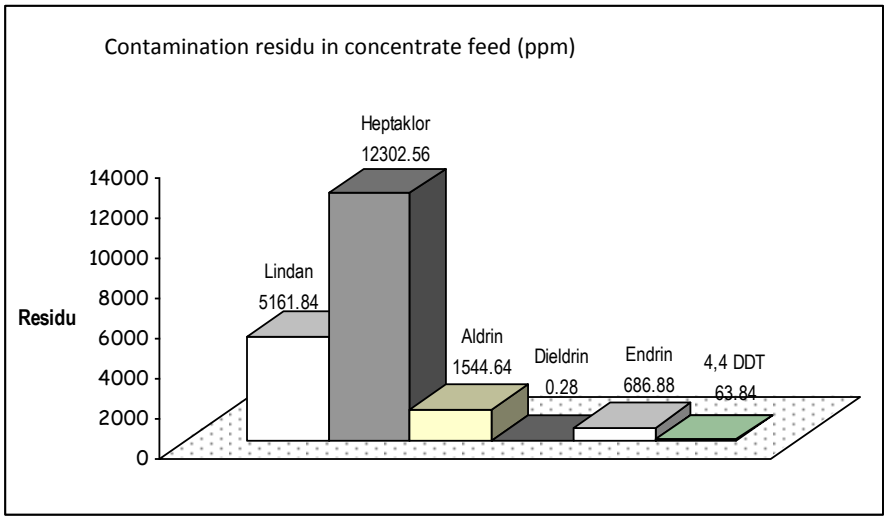

Figure2. Graphic of Pesticide Contamination in Concentrate Feed

The high level of pesticide residue in concentrate was predicted due to its raw materials which were mostly compiled from farming products and their residues. Feed materials used in the formulation of dairy cow concentrate feed produced by KUD both in research target area or in most area in Malang regency were derived from: corn, pollard, rice bran, soybean residue, *kapuk* seed peanut meal and beer dregs. Several materials such as corn, rice bran, and soybean residue were about 70% of the total material used; whereas most of the farming systems of corn, rice, and soybean utilized several types of pesticides intensively.

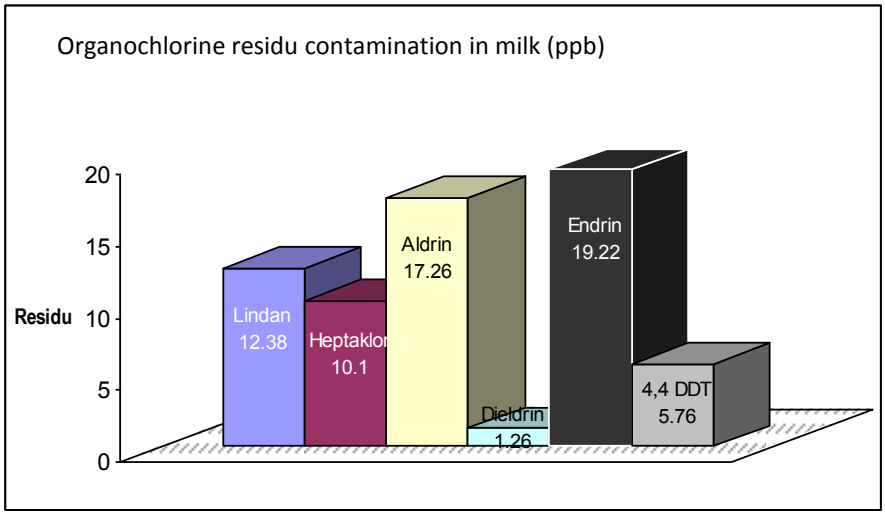

Figure 3. Profile Graphic of Pesticide Contamination in Milk Product

Figure 3 showed the contamination of 6 types of organochlorin pesticide residues that was still high and higher than the recommended ISO standards for food products in the amount of 10 ppb. While organochlorin compounds detected were compounds that were not easily degraded. It is dangerous to humans who consume it because it would remain in the body and interfere with human health.

Some organochlorin pesticide such as aldrin, endrin, and DDT were relatively high although the amount of the substance in the feed was less or undetected. Aldrin, endrin, and DDT pesticides are soluble in the water and bound with soil particles which are brought later to the water absorbance process and existed in dairy cattle water source. Therefore, contamination resource was not only from forage and concentrate. Pesticide with high persistency like aldrin, endrin, and DDT might infiltrate food chain by only small amount and experience biological magnification up to a dangerous level. If aldrin enters human tissue, it would be converted directly to dieldrin and dissolved in body fat (Ishii *et al.*, 1994; Glasgen *et al*., 1999 and Zigterman and Allison, 2005).

Relationship Pattern of Pesticide Contamination between Forage and Concentrate and Milk

The study result proved that there were 6 types of pesticide that significantly affected the relationship pattern between lindane and heptachlor from forage and concentrate towards dairy milk, as presented in **Table 1.** Observing the regression line pattern, the pesticide contamination in milk in **Figure 4, Table 2** explained the presence of lindane and heptachlor pesticide contamination in milk. The level was affected by pesticide content from forages and concentrates.

Table. 2. Regression Line and Pesticide Contribution of Forages and Concentrates towards Milk's Pesticide Contamination

Types of Pesticide	Regression Lines	Contributions	
		K	H
Haptaclor	$Y = 0.001x_1 - 0.591x_2 + 13.69$	46.91	53.09
Lindan	$Y = 3.020 + 0.001x1 + 0.018x2$	87.65	12.35
Aldrin	$Y = -0.004x_1 - 0.148x_2 + 65.436$	88.71	11.29

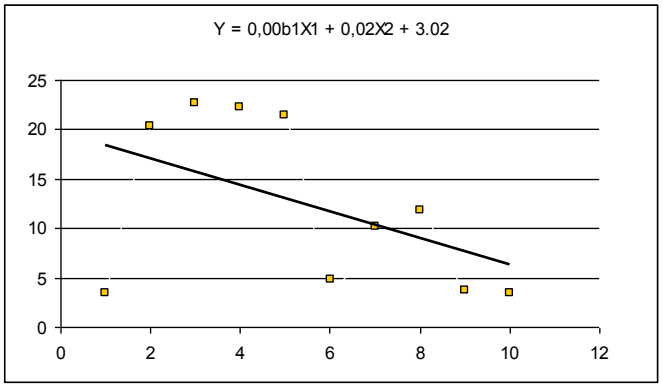

Figure 4. Regression Line and Pesticide Contribution of Forages and Concentrates towards Milk's Pesticide Contamination

Each type of pesticide has different pattern. Lindane's contribution to milk was affected by its amount from concentrate feed as much as 87.65% and from forages as high as 12.35%; whereas heptachlor in milk was affected by its amount from forages and concentrates as much as 53.10% and 46.90%. Aldrin contribution in milk was determined by aldrin concentrate 88.71% and forages 11.29%.

Based on the result from the previous chapter, dieldrin, endrin, and DDT pesticides were detected in large amount, especially in milk, although the percentage in forages and concentrates were low. It could be explained since the result of regression analysis did not give significant effects or contribution. Therefore, it can be assumed that the three pesticide contamination was caused by other factors including drinking water. Pesticide contamination in the soil, crops, and cattle might occur through a complex and dynamic mechanism of the physical processes, including chemical mechanisms and biological absorption, volatilization, both chemical and biological degradation, the flow rate of the soil surface, as well as the leaching to the consumption of the plant. Naturally, pesticide binds soil particles, especially organic matter and soil minerals (Koskinen and Harper, 1990) with various mechanisms depending on the surface area and the characteristics of the pesticide (Kookana and Aylmore, 1993).

These results became the basis theory that the future projected formula cannot be made in the form of biostarter for fermented feed but it must be in the form of probiotics to improve rumen fermentation, which can degrade pesticide contamination from various sources entering the body of the livestock either from feed, drinking water, or air.

The Effects of Probiotics Addition towards Milk Production and Fat Level

A study result on probiotics addition treatment on milk production and milk fat level was presented in graphic shown in Figure 5. Milk production increased significantly that was about 2-3 liters from the control or between 30-50% rises from the control.

This result indicated that probiotics improve nutrient digestibility in the rumen, especially polysaccharides as ruminant energy source, thus, increasing the proportion of propionic acid for the milk production and probiotics with its ability to synthesize NH3 into proteins. As the result, it intensifies protein synthesis of microbial rumen which further increases milk production.

An increase in milk production would generally lower the fat content of milk, as also occurred in this study. However, a decrease in milk fat content was not significantly different between the control and probiotic treatment sample that is an average of 4% for dairy products and milk from Jabung KUD, and 3,9% for dairy products from public farms. The fat content of milk is affected by the proportion of acetic acid as the product of crude fiber synthesis in forages. With the increasing digestion, polysaccharides tend to increase propionate proportion and lower acetate level. However, the milk fat content of the resulting treatment was still far higher than the standard fat of dairy company.

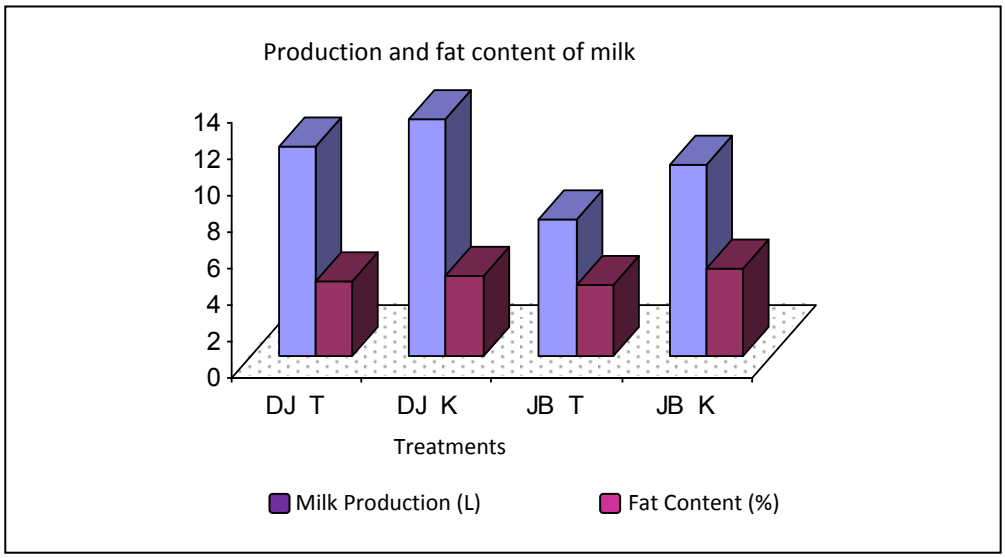

Figure 5. The Effect of Probiotics Addition towards Organochlorin Residue Content of Milk

The Effects of Probiotics Addition towards Organochlorin Residue Content

The study result of organochlorin residue detection on dairy cow milk product was presented in Figure 6.

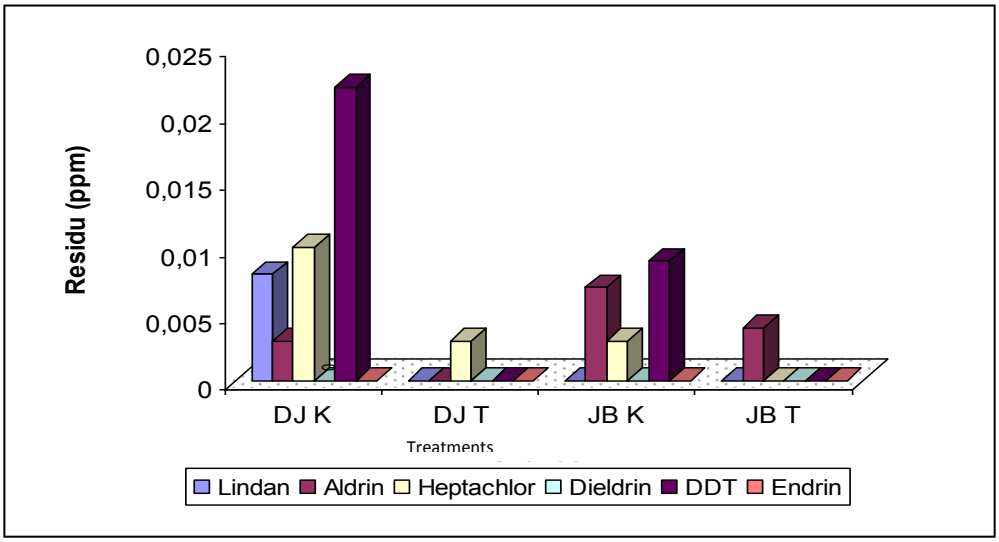

Figure 6. Organochlorin Residue Content in Milk

Residue content graphic in Figure 11 portrays that an addition in probiotics by 1% from concentrate feed might degrade Lindan, Aldrin, Dieldrin, DDT and Endrin up to 100%. The result of the real research of this was able to eliminate 5 pesticide residue types within 7-day incubation. It means that probiotics activity is higher in the anaerobic condition and the probiotics association with rumen microbe increases organochlorin degradation inside the rumen so that pesticide residue will no longer be detected in milk.

Aero bacteria and fungus which have oxidative ability in their enzyme systems are generally able to degrade organochlorin through the mechanism of mineralization (Bogan, Lamar and Hammel, 1996; Bogan and Lamar, 1996). A study result by Prihartini, *et al.* (2006) states that isolates has positive interconnection properties to degrade lignin and organochlorin. The degradation of lignin is as fast as organochlorin.

The result of the study is in accordance with previous assertion where microbes capable of degrading organic material such as lignin can also degrade synthetic organic materials. Mineralization of organochlorin 2,4-DCP and 4-CP was high on the media using organic lignin materials, while high 2,4-DCP can be generated from organic matter such as straw after 21 day incubation. Organochlorin mineralization is also high on fermented hay; the growing microflora will remodel organic materials from straw to produce initial seed in biological and enzymatic processes during organochlorin compound degradation (Benoit *et al.,* 1996).

CONCLUSIONS AND SUGGESTION

Conclusions

The conclusions formulated from the research are:

1. Feed and dairy or milk product was detected to contain 6 types of organochlorin pesticide residue such as lindan, heptachlor, aldrin, endrin, diendrin, and 4.4 DDT. Pesticide contamination source in milk was not only from feed, but also from some other sources. Pesticide has undergone changes from its original compounds into more harmful compounds.
2. Probiotics addition in concentrate feed for 1% could increase milk production by 30-40% per-day and reduce organochlorin pesticide residue in milk for about 60-100%.

Suggestion

The recommended suggestion is that the best probiotics usage level in feed is 1% from the overall concentrate feed.

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The Effect Of Feeding *Gliricidia Sepium* Leaf in The Dry Season on Ettawah Cross Bred Goat Milk Production and Quality at Households of Tumpang Regency in Malang Districts

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ABSTRACT

This research was conducted during dry season in Tumpang Regency of Malang Districts. The aim of this research was to study *Gliricidia sepium* (G. *sepium*) leaf in ration and its effect on milk production and quality of Ettawah Crossed Bred Goats (ECDG). Twenty five households were surveyed and divided into 5 groups based on the level of *G. sepium* used in ration. The 5 groups were Gs-0 (no *G. sepium* in the ration); Gs-1 (*G.sepium* 1-20% of the ration), Gs-2 (*G. sepium* of 21-30%), Gs-3 (*G.sepium* of 31-40%), and Gs-4 (*G.sepium* of 41-50%). Every week samples of milk were sampled for fat quality assessed by the Gerber method in a laboratory. Milk production data was converted to ECM values (Hemme, 2010). Dry matter (DM) of the ration was measured in proximate analyses (AOAC, 1990). The botany composition measuring *G. sepium* percentage in ration (% DM) were 0 % (Gs-0) 15,62% (Gs-1) 24,94% (Gs-2); 36,94% (Gs-3) and 43,24% (Gs-4). The Crops waste percentage of DM was 30,63 % (Gs-0) 19,84% (Gs-1) 6,05% (Gs-2); 6,77% (Gs-3) and 9,87% (Gs-4).There were significant differences ($p<0.01$) between the 5 *G sepium* rations. The ECM, fat and crude protein content in milk was 1,332; 6,63 and 3,42 (Gs-0) 1,314; 6,58 and 3,27 (Gs-1) 1,322; 6,60 and 3,33 (Gs-2); 1,333; 6,6 and 3,37 (Gs-3) and 1,323; 6,8 and 3,2 (Gs-4) respectively. A level of *G. sepium* leaf up to 40% in ration gradually increases the crude protein and fat content in ECDG milk. Therefore *G.sepium* leaf of up to 40% DM could increase the quality of Ettawah Crossed Bred Dairy Goat (ECDG) milk with regards to protein and fat content.

Key Words: *G Sepium*, ECDG Milk Production and Quality

INTRODUCTION

Dairy goat populations in Indonesia have increased gradually from 12 million in 2000 to16.7 million in 2010 (4.6% annually). In 2010 there were 3.5 million dairy goats farmers in Indonesia (BPS, 2010).The 9.5% of dairy goats farmers are located in East Java province, second largest to West Java province. Consumption of goats milk in East Java has increased and so the price per litre of goats milk has also increased. Goats milk have amino acids, buffer components, cholesterol and specific fatty acid superior to cattle milk. Tsakalidou, E. (2012) identified goats milk as having medicinal properties for the treatment of malnutrition and has a lower tendency to cause allergic reactions e.g. lactose intolerance or in the cosmetic industry.

Unfortunately, milk production of dairy goats decreases during in the dry seasons limiting the ability of farmers to capitalise on increased prices, due to the constraints of forage availability. To meet the requirements of dairy goat nutrition for milk production during the dry season, most farmers use a concentrate. The use of a concentrate increases cost of production effecting profitability. The use of *Gliricidia sepium* (*G. sepium*) at 15% of total DM ration or 50% of concentrate in dairy goats ration increases milk production and quality (Hidayati et all., 2014). How are the farmers of dairy goats in Tumpang regency using *G. sepium* during dry seasons for keeps milk production and quality.

MATERIAL AND METHOD

Research Location

Tumpang regency is a region with a high population of dairy goats. It is located in the Malang districts. It is common in this region for farmers to feed their animals with *G. sepium*. Tumpang regency lies at the foot of Bromo mountain, an area which has forest with *G. sepium* trees around the forest.

Research Material

Twenty five (25) dairy goat farmers that have 10-15 head of lactating goats were selected from the association of dairy goats in Tumpang. They were divided into 5 groups based on the amount of *G. Sepium* used in their feeding ration. The levels of *G. sepium* usedwere 0 (Gs-0), 10-20% (Gs-1), 20-30% (Gs-2), 31-40% (Gs-3) and 41-50% (Gs-4).

Research Method

Method survey was used in his research for collected data of using *G sepium*. From the first survey, we gathered data about the levels of *G. Sepium* used in rations. The 25 farmers selected were divided into 5 groups based on different levels of *G. sepium* in their rations. Observation method was used for collecting data about the composition of botany in ration, milk production and quality of milk.

The rations consisted of 4 kind of forage; they were legumes (*G. sepium)*, grass, crop waste and other forages. The botanical composition was sampled and analyzed. A sample of each ration was collected everyday during 1 weeks in 1 month, and remeasurement for the next 2 months. The botanical composition measurement was based on the percentage DM (%DM) of the total ration.
Amount of milk produced was measured along with the botany composition. It used glass volume in 1000 ml. Volume was converted into Energy corrected milk (ECM), to correct for variation in location, lactation phase and age of animals (Hemme, 2010).

Every Friday, samples were taken and assessed for milk quality. Specific gravity, protein and fat content in milk were detected by alactoscan tool, and verified using the Kjeldahl (AOAC, 1980) and Gerber methods.

Data obtained was tabulated and analyzed in completely randomized design (Steel, and Torrie. 1993).

RESULTS AND DISCUSSION

Botanical Composition

The results of the botanical composition in existing dairy goat farmers showed in Table 1.

Table 1. Feed composition of each treatment ration

	Level of *G. Sepium* as total DM in ration (A)						
	Gs-4	Gs-3	Gs-2	Gs-1	Gs-0	SEM A	P
G. sepium	28,26[a]	28,22[a]	21,32[b]	15,20[c]	0,00[d]	2,28	0,05
Grass	31,36	34,16	37,81	39,95	36,48	4,25	ns
Other leaf	34,52	32,13	32,95	30,59	32,85	5,25	ns
Crops straw	6,03[b]	4,96[b]	5,17[b]	18,95[a]	21,27[a]	2,69	0,01
Concentrate	34,12	33,71	29,24	29,46	30,67	3,39	ns
	100	100	100	100	100		

Note : a, b, c, d superscripts in the same row show significant differences between treatments (p<0,05, p<0.01)

In this study between the treatment groups farmers were feeding significantly different amounts ($p<0.05$) of *G. sepium* during dry seasons to their dairy goats (see table 1). The amounts of crop waste or straw was also fed in a significantly ($p<0.01$) smaller amount in treatments Gs-4, Gs-3, Gs-2 when compared to Gs-1 and Gs-0 rations.

The main factor influencing farmers feeding *G. Sepium* is the location of the farm. Farm from treatment groups Gs-4 and Gs-3 were located in an upland (>800 m above sea level) location near the forest containing a *G.sepium* plantation. Farms in Gs-2 and Gs-1 are located in the middle and the farm from Gs-0 was located in lowest area. The lowland area has more paddy and crops and as a result feed a greater amount of crop waste. This is a trend across several countries in Asia and Africa, that host *G. sepium* trees. The *G.sepium* leaf is considered a local, cheap and quality ruminant feed to maintain production during the dry season (Mapiye et al., 2006).

Table 2. Botany composition in the exixting dairy goats farm

Level of *G sepium* from total DM ration (A)							
Forage	Gs-4	Gs-3	Gs-2	Gs-1	Gs-0	SEM A	P
G sepium	43,24[a]	36,94[a]	25,19[b]	15,62[c]	0,00[d]	3,17	0,01
Grass	31,36	34,16	37,81	39,95	36,48	4,66	ns
Other leaf	34,52	32,13	32,95	30,59	32,85	5,74	ns
Crops straw	9,87[b]	6,77[b]	6,05[b]	19,84[a]	30,67[a]	3,25	0,01
Total	100	100	100	100	100		

Note : a,b,c,d superscript in the same row showed strongly different significantly (P<0,01)

G. sepium has been recognized as a valuable legume tree to provide energy and nitrogen to increase feed efficiency, resulting in increased performance of ruminant animals (Sajimin and Purwantari, 2006; Umunna et al., 1995 citation by Teferedegne, 2000) *G.sepium* can also be used as a supplement in a low quality ration (Wambui, 2006). *G sepium* has antimicrobials compound to kill some protozoa (Teferedegne, 2000). Tripathi et al. (2006) found that the feeding of legume tree leaves and concentrate at different levels had no significant difference($p>0.05$) on forage consumption (541 vs 536 g/d/hd ADG of sheep in post weaning ages up to 90 days (15 – 25 g/d/hd) and FCR (8,9 vs 9,0)).

The results from this project for Dry Matter (DM) consumption and the resulting milk production and quality are shown in Table 3.

Table 3 showed level of *G. sepium* in ration giving positive effect different significantly (P<0,05) on crude protein content in milk, and tend increasing milk production and fat content. Milk production between 1,322 – 1,333 *l* ECM was in the normal interval of Ettawah Dairy goats milk production of between 0.98 – 1.63 *l*/d/h (Devendra, 2007). The milk production in this study was higher than Ramahan et al (2013) where corn straw*, G. Sepium* and concentrate were fed. Breed Jamnapari, Barbari and Damascus in the early lactation could produce 1.31.kg/d/h up to10 weeks lactation. The Milk production of dairy goats in the subtropics were higher than in the tropic due to the heat stress, feeding and health management.

The lowest fat content was Gs-1, and it was predicted that feeding grass and concentrate as a ration does not provide enough nutrients for supporting high levels of milk fat synthesis due to the quality of grass during dry season being low. The ration with the lowest protein content was Gs-4, the group with the highest level of *G. sepium* in the ration. It was suggested that this is due to the tannin compounds reducing the efficacy of the rumen bacterial populations. This situation effected on protein consumption and hence the protein in the milk Tannins at 2-5% in the ration have been shown to increase milk production (Barry and Nabb, 1991).

Table 3. Milk production (d/h) and quality from the 5 ration of *G.sepium* level

Variable	Level of *G. sepium* from total DM ration (A)				
	Gs-4	Gs-3	Gs-2	Gs-1	Gs-0
DM consumption (g/d/h)	1535	1505	1524	1508	1499
Milk production (*l*)					
Mean *(l*)	0,612	0,668	0,676	0,608	0,662
SEM	0,021	0,043	0,056	0,018	0,060
Mean (ECM)	1,323	1,333	1,322	1,314	1,332
SEM	0,003	0,003	0,002	0,007	0,007
Fat content					
Mean	6,684	6,662	6,596	6,578	6,63
SEM	0,026	0,020	0,007	0,036	0,041
Protein content					
Mean	3,2[a]	3,37[a]	3,33[a]	3,27[a]	3,42[b]
SEM	0,05	0,007	0,014	0,039	0,04

Note : a, b superscript in the same row showed different significantly ($p<0,05$)

CONCLUSION

G. sepium use by farmers as a dairy goat feed could increase the protein content of milk. The level of *G. sepium* had a significant effect on the protein content in milk ($p< 0.01$). The best level of *G. sepium* in ration was 30-40% (Gs-3) from total DM forages.

G. sepium could be used as a protein source for feeding during the dry season when pasture is limited. However, it would need to be used as dry form to avoid the toxic compound in *G. sepium.*

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Chemical Composition of Broiler Chicken Breast Fed Ration with Supplementation of Protected Fatty Acid

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ABSTRACT

The experiment of protected fatty acid (PFA) supplementation in ration on chemical composition of breast broiler chicken was conducted in the field laboratory of Animal Science Faculty, Halu Oleo University. There were 48 broiler chickens, divided into 12 compartments stable. This experiment consist of 3 treatments were Control (100% commercial ration), DCM (+ 3% dry carboxylate salt mixture), COH (+3% coconut oil hydrosilate), and 4 replication. The water content of control treatment was (70.5 ±1.0%), DCM (70.0 ± 0.0 %) and COH (71.5 ±1.0 %). Crude protein of control treatment was (18.26 % ± 0.38%), DCM (19.21±0.14%), and COH (18.37 ± 0.14 %). Ether extract content was 3.15 ±0.19 (control), 1.65 ± 0.13 (DCM) and 2.5 ±0.10 (COH). The data was analyzed by using contrast orthogonal test. The result showed that supplementation of 3 % of protected fatty acids in ration has significant effect ($p<0.01$) on ether extract and ash broiler chicken breast meat but has no significant effect ($p>0.05$) on water and the crude protein contents of broiler chicken breast meat at the age of 4 weeks old.

Key Words: Chemical Composition, Protected Fatty Acid (PFA), Dry Carboxylate Salt Mixture (DCM), Coconut Oil Hydroxilase (COH)

INTRODUCTION

Meat contains a complete, balanced, and easy to digest of essential amino acids. One type of meat that is expected to meet human nutritional needs is broiler meat. Astawan (2006) states that broiler chicken meat contains high nutrition, good in flavor, aroma and tenderness, and has low price.

Protected fatty acid is oil processing result with acid and or alkaline hydrolysis eg a dry carboxylate salt mixture (DCM) (Tasse, 2010) and coconut oil hydrosilate (COH) (Samboligi, 2014). Protection of fatty acids intended to protect the free fatty acid produced from the hydrolyzed especially unsaturated fatty acids. Protected fatty acid which is not oxidized by light and heat will be produce free fatty acids such as saturated fatty acids and proventriculus and ventriculus unsaturated which can be used as energy boast for poultry such as broiler chicken besides that unsaturated fat can be found in chicken meat.

The research of DCM and COH in native chicken has been done. Apri (2014) showed that supplementation of 3% CDM and 3% COH can increase ash mineral materials. But supplementation of 3% DCM and 3% COH in the ration is not improve water content, crude protein and ether extract in the native chicken meat.

Therefore, the research of protected fatty acid DCM and COH in broilers meat needs to be conducted to observe the effect of its using on the nutrient levels include water, ash, crude protein, and ether extract content of broiler chicken breast meat.

MATHERIAL AND METHODS

Forty eight broiler chickens divided into 12 compartments stable. This experiment consist of 3 treatments were Control (100% commercial ration), DCM (+ 3% dry carboxylate salt mixture), COH (+3% coconut oil hydrosilate), and 4 replications. The water content of control treatment was (70.5

±1.0%), DCM (70.0 ± 0.0 %) and COH (71.5 ±1.0 %), crude protein content of control treatment was (18.26 % ± 0.38%) , DCM (19.21±0.14%), and COH (18.37 ± 0.14 %), and ether extract content was 3.15 ±0.19 (control), 1.65 ± 0.13 (DCM) and 2.5 ±0.10 (COH). The data obtained was analyzed by using contrast orthogonal test.

RESULT AND DISCUSSION

Water content

Water content is the percentage of material water that can be expressed based on wet or dry weight. Water content based on wet weight is the ratio between waters weight in material with total weight of materials, ,while the water content by dry weight is the ratio between the weight of water in a material with a dry weight of the material (Suryanagara, 2006). Water content of broiler chicken breast that added 3% protected fatty acid can show in Table 1.

Table 1. Chemical composition of breast broiler chicken on ration supplemented protected fatty acids.

Variable	Control	DCM	COH
Water (%)	70.5 ±1.0	70.0 ±0.0	71.5 ± 1.0
Ash (%)	3.15 ± 0.19 c	1.65 ± 0.13 a	2.5 ± 0.22 b
Crude Protein (%)	18.26 ± 0.38	19.21 ± 0.14	18.37 ± 0.14
Ether extract (%)	3.7 ± 0.18 b	3.4 ± 0.17 b	2.8 ± 0.10 a

*Different superscript at the same row showed significant difference

Supplementation of 3% protected fatty acid in ration has not significant effect (p> 0.05) on water content of chicken breast. So that, the supplementation of protected fatty acids in the diet has not been able to reduce water content of chicken breast meat. It was caused by before the research is conducted, the samples was freezing for 1 week causing increasing the level of water content in COH treatment. Water content of meat is influenced by retention time, this is due to the occurrence of hydrolysis process and meat will be more binding water or absorbs the oxygen from the temperature of freezer so that the free water in meat will be increased. This is appropriate with the higher of WHC is due to protease enzymes activity to the loosing of meat microstructure so that can absorbs more water.(Soeparno, 2009).

Water content of chicken breast with addition 3% protected fatty acid in rations for 2 weeks ranged between 70.0% -72.5%. It is higher than Apri (2014), that water content of breast meat with addition 3% protected fatty acid ranged between 62.77% - 71.27%. Whereas, Supadmo (1997) observe the water content broiler chicken meat that added 4% *lemuru* fish oil is 74.87 %, while the control is 74.92%. Using of several different types of fatty acids do not affect water content of meat (Coetzee & Hoffman, 2002). Water content is affected by the difference of chicken species and age, and environmental conditions such as temperature and humidity.

Ash content

Supplementation of 3% protected fatty acid in ration is very significant (p> 0.01) on ash content of chicken breast meat (Table 1). Ash content of chicken breast meat on supplementation of 3% fatty acid protected, DCM and COH treatments is lower than control. Otherwise, ash content of chicken breast meat with supplementation of 3% DCM is lower than COH. This shows that supplementation of 3% protected fatty acid in ration can decrease ash content of chicken breast meat.

Ash content of chicken breast in ths reseacrh ranged between 1.5% - 3.35%. It is lower than Apri (2014), that ash content of chicken breast with supplementation of 3% protected fatty acid ranged between 3.62% - 4.07%. Komala (2013) observe that ash content of native chicken breast is

1%, while Wardani (2012) states that ash content of meat is 1.05% - 1.06%, and 1% (Rasyaf, 1998). Ash content of native chicken breast with supplementation of 5% Omega-3 is 1.05%, while broiler chicken breast is 1.70%.

Ash content of chicken breast meat is related with water content and crude protein of meat and fat-free tissue. deMan (1997) states that lean beef relatively contain more minerals.

Crude protein

Protein is an important chemical compound in meat because it contains amino acids required in food. Meat protein is a good quality protein because it contains essential amino acids and the amount equivalent with the human body needs and high digestibility and easily absorbed (Mountney et al., 1995).

In this research, supplementation of 3% protected fatty acid in ration has no significant ($p > 0.05$) on crude protein of chicken breast. So that addition of protected fatty acids in the diet has not been able to increase the crude protein of chicken breast meat.

Crude protein of chicken breast with addition of 3% protected fatty acid in rations for 2 weeks ranged between 18.8% -19.25%. This result is lower than Apri (2014) that crude protein of native chicken breast meat with addition of 3% protected fatty acid ranged between 19.85% - 23.20%.

Broiler chickens were observed at 27 days of age, had 14.2% crude protein content, 14% at 42 days, and 13.9% at 56 days and concluded that increasing in broiler chicken age can reduce the percentage of chicken meat protein (Santoso & Tanaka, 2000). Coetzee & Hoffman (2002) also mentioned that using of several different types of fatty acids do not affect the crude protein meat.

Crude protein levels in this study were in the normal range, (18% vs. 18% - 22%). It is accordingly raised by Soeparno (2005) that a normal meat protein is 16-22%.

Ether extract

Supplementation of 3 % protected fatty acid in ration shows very significant effect ($p > 0.01$) on ether extract of chicken breast (Table 1). Crude fat levels in chicken breast meat with addition of 3% protected fatty acids, DCM and COH is lower than control. Otherwise, crude fat level of chicken breast meat with addition of 3% COH is lower than DCM treatment. This shows that addition of 3% protected fatty acid in the form hydrolyzed vegetable oil in rations decrease ether extract content of chicken breast meat. It is because of the fatty acids were used is copra oil which contains trans-fatty acids are from by the oxidation of light and heat process. Trans-fatty acids can decrease the ether extract of animal products.

Ether extrat of chicken breast meat with addition of 3% protected fatty acid in ration for 2 weeks ranged between 2.8%-3.8%. Results of this research are lower in compared with April (2014) that ether extract of native chicken breast meat with addition of 3% protected fatty acid ranged between 2.72%-4.80%. This is in accordance with Coetzee & Hoffman (2002) that using of several different types of fatty acids do not affect the ether extract of meat. Supadmo (1997) reported that broiler chicken fat levels that added 4% of lemuru fish in ration is 3.66%. While Komala (2013) state that ether extract of native chicken is 4.7%. According to Mountney (1996), crude fat level is varies depending on age, gender, and animal species.

CONCLUSION

Supplementation of 3% protected fatty acids in ration has significant effect on ash and ether extract content, but has no significant effect on water and crude protein content of broiler chicken breast meat.

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Usage of Antibiotic on Chicken Poultry in District of Malang, East Java, Indonesia

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ABSTRACT

Usage of antibiotics on chicken poultry has been used for long time to control bacterial diseases. It is easy to obtain antibiotic on the market because there is an aim to increase productivity of livestock-based food quickly. However, it has encouraged the use of drug excessively without regard to the security aspect of livestock products produced. This study was conducted to determine the use of antibiotics on chicken farms in District of Malang. Research subjects were farmers who apply antibiotics on their chicken poultry. Primary data collection was done with a structured interview, and followed by in-depth interview for some key respondents. Secondary data was obtained from the Central Bureau of Statistics and the Department of Agriculture/Animal Husbandry, meanwhile data of antibiotic products was derived from drug companies or Veterinary Drug Association. The research result showed that the majority of chicken farmers in Malang use antibiotics, only a few of them gave multi-vitamin/ mineral and herbal medicine. Most farmers use the same antibiotics for the last 3 years and they determine drug dosage based on average weight of chicken, consequently a number of bacteria could be resistant to antibiotics, already. If one year District of Malang requires antibiotic dose of 3.315 billion, the cost required reaches approximately Rp 2.87 trillion. It needs to guide the farmers to use antibiotics wisely: change antibiotics, determine the dose and timing of giving antibiotics.

Key Words: Antibiotic Usage, Chicken Poultry, Food Safety

INTRODUCTION

Poultry play an important role in the food supply, especially as a source of animal protein in Indonesia. In 2010, the production of poultry meat amounted to 1,214.34 thousand tons, contributing as much as 53.76% of the national meat production. While egg production of laying hens reached 945.64 thousand tons, it is 69.87 percent of the total national egg production that reached 11,366.20 thousand tons (DITJENNAK, 2012). East Java is the province with the largest population of laying hens in Indonesia, which in 2012 reached 37,974,058 tails (DEPTAN, 2012).

Health is one of the factors that influence the increase of chicken productivity. One of the diseases that often threaten the health of poultry farm is bacterial infectious diseases. In the control of the disease, farmers generally use antibiotics.

Antibiotic is chemical compounds produced by a variety of microorganisms, such as bacteria and fungi that have the function to stop the growth or kill microorganisms. Natural antibiotic is obtained naturally by micro-organism, meanwhile synthetic antibiotic is produced in the laboratory. The semi-synthetic antibiotic is produced by microorganisms and modified in the laboratory by adding a chemical compound.

Antibiotics are divided into 4 groups based on how it works, namely: (1) inhibiting cell wall synthesis, such as Penicillin, Bacitrasin, Novobiosin, Sefalosporin and Vancomisin; (2) destroying cell membrane, such as Polimixin, Colistin, Novobiosin, Gentamisin, Nistatin and Amfoterisin B; (3) inhibiting protein synthesis, such as Tetrasiklin, Khloramfenikol, Neomisin, Streptomisin, Kanamisin, eritromisin, Oleandomisin, Tilosin and Linkomisin; (4) inhibiting synthesis of nucleic acids, such as Aktinomisin, Sulfonamida and kuinolon derivatives (Nester *et al.*, 2012).

In addition to the treatment of diseases, antibiotics are also used as growth promoters, to stimulate the growth of livestock (Widiastuti and Murdiati, 2011; Zalizar and Rahayu,2015). Safety factors must be considered; including the safety of livestock products from residues of antibiotics used. Almost all commercial feed (85.70%) contains antibiotics, i.e. coccidiostat 50%, and 33% anti-fungal medication. It is confirmed that the opportunities for other drug residues in meat and eggs (Bahri et al, 2005).

Prediction of resistance can be known from how farmer's behavior in delivering drugs. Is there any variety of drugs used or they always give the same kind of medicine for many years. Therefore it is necessary to investigate the behavior of farmers in using antibiotic drug.

Excessive usage of antibiotics will cause residues in livestock products such as meat, milk and eggs. The residue will cause resistance, allergy or poisoning on consumers. The presence of residues in livestock products could be avoided if all parties pay attention and obey to the using rules and downtime of antibiotics. The presence of antibiotic residues in livestock products will be a constraint in the supply of livestock products as an export commodity. Consequently, livestock products from Indonesia are unacceptable in global trade and the trust on Indonesian livestock products will decrease.

Antibiotic residues on livestock products have been reported by several researchers. From 93 samples of fresh chicken meat in West Java, it was found residues of tetracycline class antibiotics by 70%, and class of chlortetracycline (CTC) by 30% (Murdiati et al., 1988).

Results of survey on chicken farm in Malang by Zalizar and Rahayu (2005) shows cases of colibasilosis caused by Escherichia coli (E. coli), and koriza caused by *Hemophilus gallinarum*. Control of these two diseases commonly used antibiotics. Antibiotics are also used extensively on farms, suppose they are added in the feed with a lower dose with mean to prevent disease and increase weight of chicken.

Excessive use of antibiotics can lead to resistance. One hundred percent of E. coli isolates collected at the Laboratory of Microbiology, Faculty of Veterinary Medicine, University of Gadjah Mada are resistant to antibiotics of Lincomycin, danofloxacin; 80% were resistant to amoxycillin ampicillin; 60% were resistant to streptomycin; 40% were resistant to doxycycline; 20% were resistant to erythromycin (Krisnaningsih et al. 2005). Therefore it is necessary to investigate how big these types of applications in the field of antibiotics as well as evaluating the overall behavior of drug application.

This study was conducted to determine the use of antibiotics on chicken farms in District of Malang. The expected result is data about: 1) Farmer's Attitude toward bacterial diseases and pattern of antibiotic usage 2) the usage level of antibiotics (number of doses of the drug for the entire chicken population in District of Malang); 3) the average price of the drugs used; 4) types of drugs sold on the market 5) types of drugs most commonly used by farmers; and 6) frequency of drug usage in one production period.

MATERIALS AND METHODS

Research location was in District of Malang, East Java, Indonesia. This district is included in five biggest populations of chicken poultry in East Java. The sampling technique used is multistage sampling. First step chose the village sample, namely the center area of chicken production. Second step chose the poultry sample, namely them who applied antibiotics to the chicken.

Primary data included: social and economic data and the application of antibiotics on the poultry. It was obtained by a structured interview with farmers respondents and followed by in-depth interview for some key respondents. Secondary data was obtained from the Central Bureau of Statistics and the Department of Agriculture/Animal Husbandry, meanwhile data of antibiotic products was derived from drug companies or Veterinary Drug Association.

A quantitative descriptive analysis was used to analyze the data of antibiotics usage on poultry farms which includes the average price of antibiotics, the cost of the use of antibiotics per

chicken, the total cost of antibiotics needs in District of Malang, types of drugs most widely sold in the market, the type of herbal medicine and variations of drug usage.

RESULT AND DISCUSSION

Characteristics of Poultry That Use Antibiotics

All chicken poultries in District of Malang use chemical antibiotics to fight bacterial infections. Therefore, the observation of antibiotic usage was done on both poultries category, laying hens (65 poultries) and broiler (95 poultries).

Table 1. The number of laying hens sample in District of Malang*)

No	Sub District	Number
1.	Bululawang	3
2.	Dampit	3
3.	Karangploso	6
4.	Lawang	1
5.	Pakis	4
6.	Poncokusumo	14
7.	Tajinan	3
8.	Tumpang	20
9.	Turen	1
10.	Wajak	3
11.	Wonosari	7
	Total	65

*) Minimum population 5000 chicken and they use antibiotics

Research in Malang was conducted at the poultry farm that spread over eleven (11) sub-districts. The largest number of samples was located in the district of Tumpang, i.e. 20 farmers.

Farmer's Attitude Toward Bacterial Diseases and Pattern of Antibiotic Usage

According to the farmers, cases of disease caused by bacterial infection on laying hens and broiler farms often happen (> 7 cases per year) or quite often (4-6 cases per year). For example, snot disease or koriza caused by bacteria of Haemaphilus gallinarum was found by most farmers (38%) for about seven cases each year (Table 2). However, certain diseases are rare enough (<4 cases per year).

Many factors influence the occurrence of disease cases. Among them are environmental and sanitation factors. Malang District has high temperature and humidity. It supports the growth of bacteria, fungi and parasitic worms. Moreover, poor sanitation also supports bacterial infections.

To treat a bacterial disease, the majority of chicken farmers in Malang (93%) use antibiotics. Only a few farmers (4%) did not use antibiotics, they gave multi-vitamin/mineral and herbal medicine.

As many as 54% of broiler and laying hens farmers in Malang stated that they always use the same type of antibiotics continuously for the last three years. The main reasons are because the drug has already rationed from the partner (a business partnership with a Cattlemen's company), they has already knew the drug usage, they are familiar and feel appropriate. However, the farmers do not understand that giving the same drug continuously for a long time cause chicken's resistance to the drug. So, it needs to give guidance to them about the wise and effective management in giving antibiotics.

Table 2. Farmers' opinion to the case of snot/koriza diseases caused by bacteria of *Haemaphilus gallinarum*

No	Explanation	Frequency	Percentage
1	Often (>7 cases per year)	60	38%
2	Moderate (4-6 cases per year)	47	29%
3	Rare (<4 kasus dalam 1 tahun)	53	33%
4	Did not answer	0	0%
Total		160	100%

Table 3. Farmers' opinion on how to overcome bacterial diseases

No	Explanation	Frequency	Percentage
1	Using antibiotic	148	93%
2	Not using antibiotic	7	4%
3	Using another way	3	2%
4	Did not answer	2	1%
Total		160	100%

Although the farmers have been using antibiotics, most of them argued that their poultry had already been treated but not always cured, the disease still persist (table 4). It shows the decline of effectiveness of the drugs already given to the poultry.

Table 4. Farmers' opinion about the effectiveness of using antibiotics

No	Explanation	Frequency	Percentage
1	although has been treated, disease does not always recover (diseases still remain)	123	77%
2	The disease recovered	31	19%
3	Did not answer	6	4%
Total		160	100%

A number of bacteria could be resistant to antibiotics, already. For example, 100% isolates of bacteria Escherichia coli, collection of Microbiology Laboratory - Faculty of Veterinary Medicine - University of Gadjah Mada, resistant to antibiotics.

The research results showed that the antibiotics most commonly used by poultry farms (laying hens and broilers) in Malang is a combination of trimethoprim and sulfadiazine (Table 5). The combination is highly synergistic antibiotics to fight the infections of Gram-positive and Gram negative aerobic bacterial (Drug.com, accessed August 17, 2015). If it is given orally to broiler chickens, this drug combination works 80% (Baert, De Baere, Croubels and De Backer, 2003).

The second type of antibiotics most often used by laying hens and broilers poultries in Malang is amoxicillin (Table 5). A study has done by Krisnaningsih et al. (2005), shows that 80% of Escherichia coli isolates are resistant to antibiotics of ampicillin and amoxicillin. The bacteria of Escherichia coli in chicken farms often cause colibacillosis disease. If the bacteria are resistant to the antibiotics, the prevention to the disease needs to look for other types of antibiotics.

Table 5. Type of antibiotics used at chicken poultry in District of Malang

No	Composision of antibiotic	Percentage (%)
1	Sulfadiazine and trimethoprim	25,11
2	Amoxicillin	14,15
3	Enrofloxacin	12,33
4	Amoxicillin and colistin	10,04
5	Erythromycin and doxycyclin	7,31
6	Sulfonamide	6,39
7	Tetracycline HCL and erythromycin	1,83
8	Quinolon	1,83
9	Oxytetracycline HCL	1,83
10	Oxytetracycline dan neomycine sulfat	1,83
11	Ampicilin dan colistin	0,91
12	Ciprofloxacin	0,91
13	Golongan makrolida	0,91
14	Rifamycin	0,46
15	Penicillin	0,46
16	Aminoglikosida	0,46
17	Did not answer	13,24
	Total	100

Table 6. Behavior in using antibiotics

No	Description	Frequency	Percentage
1	Always use the same antibiotic for the last 3 years	87	54%
2	Do not use the same antibiotic in last 3 years	68	43%
3	Did not answer	5	3%
Total		160	100%

Most farmers in Malang determine drug dosage based on average weight of chicken (Table 7). However, there is 35% of farmers who determined standard doses of drugs based on the weight of the biggest chicken.

Table 7. How to determine the dose of drug

No	Description	Frequency	Percentage
1	Based on the average weight of chickens	127	79%
2	Based on the biggest chicken weight	26	16%
3	Did not answer	7	4%
Total		160	100%

Giving drugs with the average dose to the chickens which have weight that exceeds the average body weight will cause under dosing. It can lead to resistance to the drug given (Burgess et al, 2012).

Table 8. Last drug-treatment before the chicken sold

No	Description	Frequency	Percentage
1	1 day before	5	3%
2	3 days before	36	23%
3	5 days before	34	21%
4	7 days before	24	15%
5	Others (4 or 6 days before)	61	38%
Total		160	100%

Most farmers in Malang already know not to give antibiotics the day before the sale (Table 8), It was a great relief because if the day before the sale is treated antibiotics it is concerned that there is still a residue found in chicken meat. Nevertheless, it should be given counseling to five (5) the poultry farmers in Malang which still gives the drug a day before the sale.

Antibiotic residues in livestock products have been reported several researchers. In fresh chicken meat samples found in West Java class antibiotic residues tetrasiklin70% of 93 samples and a group chlortetracycline (CTC) 30% of 93 samples (Murdiati et al., 1988).

The presence of antibiotic residues will cause a decline in the level of public health as it can lead to resistance, allergic reactions or poisoning. In addition, if people frequently consume poultry products which still contain residues of antibiotics will disrupt the balance of microorganisms in the digestive tract that result in disorders of digestion and absorption of food.

Actually the use of antibiotics in chicken farming can gradually be reduced. This is because as much as 2 percent (3 of 160) farmers in Malang states have tried to overcome bacterial disease without the use of antibiotics and perform other way. Generally, breeders isolate the sick animals, giving vitamin and give herbs or herbal medicine. In addition there are breeders who overcome bacterial infection by giving a pure vitamin C into the drinking water is 1 gram of vitamin C dissolved in 1 liter of drinking water. Pure vitamin C preparations are aimed to lower the pH of drinking water under normal pH is around pH 5.5 to 6. This is done breeders to kill bacteria contained in the water because the bacteria are generally not acid resistant and live a normal temperature of about pH 6 , 8 to 7.5 (Nester, Anderson and Roberts, 2012).

A total of seventy-three (73) percent of laying hens and broiler breeders in Malang never use herbal medicine to overcome bacterial disease. However, there are 33 160 people (33 percent) of farmers in Malang who already use herbal remedies to overcome bacterial disease (Table 9).

Table 9. Usage of herbs to prevent bacterial diseases on chicken poultries in Malang District

No	Description	Frequency	Percentage
1	Ever give herbal	33	21%
2	Never give herbal	117	73%
3	Did not answer	10	6%
Total		160	100%

The farmers, who use herbs remedies, include garlic, ginger, betel leaf, turmeric, noni, brown sugar, binahong, black *temu*, and others. Many researchers have reported the benefits of

various types of herbs for health. Researchers themselves have proven antibiotic potency of garlic, *meniran* (Phylanthus niruri) and betel leaves (Zalizar, et al, 2013 and Zalizar 2013). Therefore, it is necessary to encourage farmers to give herbs antibiotics to their poultries to overcome bacterial infections.

Potency Usage of Antibiotics in Poultry in Malang

Potential usage of antibiotics in Malang is very high considering the population of broiler dan layer (Table 10).

Table 10. Population of chicken in District of Malang (tail)*

No	Population	2014	2013	2012
1	Laying hens	41.156.842	43.066.361	40.268.631
2	Broilers	179.830.682	52.288.601	51.981.778
Total		220.987.524	95.354.962	92.250.409

*Source : Animal Husbandry Department of East Java

If you look at the data in 2014, the population of broiler and layer reached approximately 221 million birds (Table 10). Most farmers in Malang district where the sick chickens are given antibiotics for 5 consecutive days (Table 11). Therefore, if the average chickens (laying hens and broilers) within one year only sick three (3) times and treated for five (5) consecutive days then in a year the potential use of antibiotics there are at least 3,315 billion doses (Table 12) ,

Table 11. Duration of giving drug during illness of chicken (day)

No	Answer	Description	Frequency	Percentage
1	A	3 days consecutive	17	26%
2	B	5 days consecutive	30	46%
3	C	7 days consecutive	8	12%
4	D	only until healing	5	8%
5		Did not answer	5	8%
		Total	65	100%

Prices vary depending on the antibiotic content/composition of the drug in it and the packaging. On all medicine packaging found no data on how the prices of medicines per chicken, so researchers are trying to process existing data of the number of doses available, the need per chicken and the price of each package so found the price for each chicken. Chicken was assumed body weight of at least 1 kg so as to facilitate researchers to determine the price per chicken.

Price of antibiotics for every chicken is expected to average Rp 865.26. If one year District of Malang requires antibiotic dose of 3.315 billion, the cost required more or less reached Rp 2.87 trillion.

Table 12. Cost of antibiotics (Rp per chicken)*

No	Drug name or composition	preparation	Cost per chicken (Rp)**
1	sulfadiazine and trimethopim	caplet	100
2	amoxicillin	tablet	499.5
3	sulfadiazine and trimethopim	bolus	4,216.67
4	amoxicillin and colistin	water-soluble powder	869
5	erythromycin and doxycyclin	water-soluble powder	180
6	Enrofloxacin	water-soluble powder	78.75
7	Tetracycline HCL and erythromycin	capsule	500
8	enrofloxacin	solution	44
9	enrofloxacin	sachet	900
10	Quinolon	Tablet	700
11	oxytetracycline HCL	injection solution	235
12	ampicilin and colistin	water-soluble powder	356
13	Ciprofloxacin	injection solution	1,500
14	oxytetracycline and neomycine sulfat	water-soluble powder	2300
15	Sulfonamide	injection solution	500
	Average (Rp)		865.26

* Data obtained from several sources

** Data analyzed and accessed from internet on 17 August 2015, for 1 kg minimum weight

CONCLUSIONS

- The majority of chicken farmers in Malang use antibiotics to fight against bacterial infection, only a few of them gave multi-vitamin/ mineral and herbal medicine.
- Most farmers use the same antibiotic for at least 3 years continuously.
- Most of farmers determine drug dosage based on average weight of chicken, it can cause under dosing and lead drug resistance.
- Type of antibiotic were often used by the farmers are combination of sulfadiazine and trimethropim, amoxicillin and enrofloxacin.
- If one year District of Malang requires antibiotic 3.315 billion doses, the cost required reaches approximately Rp 2.87 trillion.

SUGGESTIONS

It needs to guide the farmers to use antibiotics wisely: change antibiotics, determine the dose and timing of giving antibiotics.

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Evaluation Model of Protected Fish Oil Supplementation to Realize The Quality and Productivity of Goat in The Doko District

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ABSTRACT

The aim of this study was to evaluate the protected fish oil supplementation by calcium hydroxide in the diets for productivities of goat. The method in this study was *in vivo* assigned into randomized block design with 3 treatments and three groups body weight. The treatments were R_0: basal diet without oil supplementation, R_1: basal diet + 4% fish oil, R_2: basal diet + 4% Ca-fish oil. The variables measured [were] blood profile and body weight gain. Data analysis using Varian analysis, if the treatment showed significant difference, we used performed Duncan Multiple Range Test. The results showed that supplementation of protected fish oil by calcium hydroxide gave the real difference ($P<0.05$) on decreased of total cholesterol (R2=13.67±7.02 mg/dl), decreased of LDL (R2=1.33±1.53 mg/dl), and did not significantly ($P>0.05$) on decreased of HDL (R2=0.33±1.15 mg/dl), and gave very real difference ($P<0.01$) on body weight gain (R2=50.00±2.01 g/d). It was concluded that supplementation of protected fish oil by calcium hydroxide (R2) decreased the highest blood profile and increased the highest of body weight gain.

Key Words: Fish Oil Protected, Calcium Hydroxide, Productivity, Quality, Goat

INTRODUCTION

Goat is a commodity that has great potential to be developed. This is because goats are relatively inexpensive when compared to large ruminants. Besides raising goats can be done with a relatively small capital , so it is very suitable commodity for farmers in Indonesia , especially for small -scale family farmers - ranchers. Goats are also more efficient in utilizing feed with faster growth than large ruminants. With several advantages possessed by these goats commodity , then the goat farm potential to be developed. To realize the development of business opportunities such as the selection of feed ingredients that have economic value and high nutrition to achieve optimal production and quality. Productivity and quality of results depends on the quality of livestock feed. Oil supplementation in ruminant rations are often used to improve the productivity and quality of livestock carcasses. Lemuru oil, often used as an energy source and a source of unsaturated fatty acids in ruminant rations.

Ruminant animal feed ingredients that contain fatty acids long-chain polyunsaturated (poly unsaturated fatty acids/PUFA) often become inefficient for ruminants because PUFA will in biohidrogenasi in the rumen became saturated fatty acids / saturated fatty acids. PUFA changes into saturated fatty acids will make the high saturated fatty acids in livestock.

Oil supplementation in ruminant rations can disrupt rumen microbial growth, because unsaturated fatty acids may interfere with the growth of microbes (Adawiah et al, 2006). Fat as non-polar compounds, not easily soluble in rumen fluid medium, because it is fat tend to associate with food particles and rumen microbes, association forms a physical surface closure by fat (Pantoja et al., 1994), so the high fat content in ration interfere with the growth of rumen microbes.

Oil supplementation protected aimed so that the oil does not disturb the fermentation in the rumen and provide fatty acids for the land lord. The use of oils in ruminant rations in addition to

supply essential fatty acids are also expected to be a precursor for the synthesis of fatty acids that are beneficial to health such as low levels of cholesterol in animal products.

Adawiah (2006) supplementation of fish oil and vegetable oils with levels of 1.5 % does not interfere with the digestive system in the rumen. In addition the use of oil supplementation with 3% level and the level of 4.5% by Jenkins and Palmquist (1984).

Increased levels of unsaturated fats in ruminants results difficult to achieve due to the consumption of unsaturated fatty acids will experience biohidrogenasi in the rumen, so as to increase the levels of unsaturated fat that is achieved by preventing biohidrogenasi unsaturated fatty acids by way of protective fatty acids / oils . Type of protection is carried out in this study with the addition of calcium on fish oil.

MATERIALS AND METHODS

This study uses 9 tails goats as experimental animals. Feed used in this study consisted of elephant grass as a basal feed and concentrate with content of crude protein 15.13% and added of protected fish oil by calcium hydroxide and unprotected fish oil as a treatment.

Research carried out by using the experimental method randomized block design with 3 treatments and 3 replications. The feed treatments as follows:

R0: forage + concentrate (without treatment)

R1: forage + concentrate + 4% fish oil

R2: forage + concentrate + 4% protected fish oil

The feed were *Pennisetum purpureum* cv. Moot and concentrated. DM ration of forage: concentrate = 50: 50%. R1 and R2 on the treatment of oil addition were as much as 4% of the ration. Provision of oil mixed with the concentrate just before given to goat.

This study covers two periods of the protected fish oil manufacturing and in vivo experimental phase. In phase two trial in vivo include the period of adaptation period and the period of data collection. Principle of protected fish oil is hydrolyzed by calcium hydroxide into glycerol and fatty acid. Preliminary phase made for 1 week to allow time for adaptation to the conditions of the study, especially the goat enclosure and feed. The phase of data collection were carried out for 4 weeks to determine the effect of fish oil supplementation protected to blood profile and body weight gain. At this phase each of the goats were fed according to treatment. Provision of drinking water was adlibitum.

Variables observed in this study that the blood profile (decreased levels of cholesterol and LDL, and HDL levels) and body weight gain. The data in this study were tabulated and analyzed by analysis of variance (variance) of experiments using randomized block design.

RESULTS AND DISCUSSION

High blood fat levels are some of the excess fat component of blood, especially the increase in total cholesterol levels. The amount of fat in the blood indicates the number of levels of fat in the meat of cattle. Cholesterol is very worried today because it can lead to atherosclerosis, where there is accumulation of materials containing cholesterol on the walls of the blood vessels that cause clotting, causing blockage of the arteries. Mean blood profiles during the study are presented in Table1.

Based on the results of analysis of variance, a protected fish oil supplementation gave the real effect ($P<0.05$) for total cholesterol. The highest of cholesterol decreased on treatment R2 (protected fish oil) were13.67±7.02 mg/dl. The lowest cholesterol decreased in the treatment of fish oil supplementation were -3.33±0.58 mg/dl or an increase of 3.33±0.58 mg/dl.

The treatment of fish oil and control gave higher values of total cholesterol when compared with treatment protected fish oil indicate that the absorption of saturated fatty acids in the treatment of both higher. The high absorption of saturated fatty acids is determined by two factors:

consumption fatty acid saturated or unsaturated fatty acid consumption is high but has biohidrogenation by rumen microbes.

Table1. Mean blood profiles during the study.

Treatment	Blood profile (mg/dl)		
	Cholesterol decreased	LDL decreased	HDL indcreased
R0	-1.00 ± 1.73[a]	-1.00 ± 0.01[a]	-0.53 ± 0.58
R1	-3.33 ± 0.58[a]	-1.33 ± 0.58[a]	-0.33 ± 1.15
R2	13.67 ± 7.02[b]	1.33 ± 1.53[b]	0.33 ± 1.15

Description: [ab] Different superscript in the same column are the real difference effect (P<0.05)

On protected fish oil treatment decreased total cholesterol biohidrogenation more due process can be prevented, which is the process of fat protection with calcium hydroxide. Calcium hydroxide compounds are base that can be used in the saponification process of calcification phase. Protected oil was used so for did not interfere with rumen fermentation system and can provide essential fatty acids to the post-rumen. Protected fatty acid is formed from the reaction of saturated and unsaturated fatty acids with ions calcium (Fernandez, 1999).

On protected fish oil treatment decreased total cholesterol biohidrogenation more due process can be prevented , which is the process of fat protection with calcium hydroxide . Calcium hydroxide compounds are basic compounds that can be used in the saponification process of calcification phase. Protected oil is used so much oil supplementation does not interfere with rumen fermentation system and can provide essential fatty acids to the post- rumen. Protected oil leak acid is formed from the reaction of saturated and unsaturated fatty acids with calcium ions (Fernandez , 1999). Levels of unsaturated fatty acids contained in fish oil can stimulate the secretion of cholesterol via the bile from the liver into the intestine and stimulates catabolism and LDL cholesterol in the liver back into bile acids, causing cholesterol levels down (Sudibya, 1998). This suggests that the unsaturated fatty acids contained in the soap calcium and fish oil successfully protected so not degraded in the rumen.

Results of research conducted by Adawiah, et al (2006), fish oil supplementation of calcium soaps produce lower cholesterol levels (74 mg/dl) compared to fish oil supplementation without protection (81 mg/dl). Joseph (2007) added the results of the study, a protected fish oil supplementation on sheep produce lower levels of cholesterol (69.37 mg/dl) compared to fish oil supplementation without protection (140.32 mg/dl).

Mechanism of protected fish oil by calcium hydroxide is not based on the melting point of fatty acids, but based on the level of acidity or pH. Protected fish oil calcium hydroxide is still intact on the acidity of the neutral atmosphere, and separately on the high level of acidity in the abomasum pH range 3 (Fernandez, 1999). It is suitable for protected fish oil supplementation where bonding calcium and unsaturated fatty acids on ruminal pH will be stable and will be released in the abomasum pH, so that the host animal is able to utilize without having saturated fatty acids in the rumen biohidrogenation process.

Kook et al., (2002) reported that fish oil is not protected increases serum cholesterol bovine blood. It is seen in sheep fed rations with fish oil supplements and corn oil (81 and 83 mg/dl) had higher cholesterol levels than fish oil supplements calcium soap and corn oil calcium soaps. While cholesterol sheep fed fish oil diet zinc soap and zinc soap corn oil (96 and 84 mg/dl) compared with sheep serum cholesterol fed fish oil and corn oil without protection. This suggests that making soap with mineral zinc is ineffective, remains unsaturated fatty acids are degraded in the rumen there by increasing sheep blood serum cholesterol levels.

Based on the results of analysis of variance, the protected fish oil supplementation calcium hydroxide gave significant effect (P <0.05), in the decrease of LDL levels. The highest LDL reduction at protected fish oil supplementation treatment were 1.33 ± 1.53 mg/dl, and lowest decrease occurred in fish oil supplementation were -1.33 ± 0.58 mg/dl or an increase of 1.33 ± 0.58 mg/dl but

not significantly different from the control treatment-1.00 ± 0.01mg/dl or an increase of 1.00±0.01mg/dl.

The low levels of LDL lowering fish oil supplementation in the treatment and control treatment due to process biohidrogenation unsaturated fatty acids by rumen microbes to saturated fatty acids. While on treatment of protected fish oil supplementation of calcium hydroxide to give value decreased levels of LDL substantial due process minimum biohidrogenation unsaturated fatty acids in the diet because of the oil protection by calcium hydroxide. A decreased level of LDL pattern follows the pattern of decline in total cholesterol levels.

Based on the results of analysis of variance, a protected fish oil supplementation did not significant (P>0.05) to increase HDL levels. HDL levels provide a relatively equal value, but there is a trend protected fish oil supplementation treatment gives a higher value when compared with other treatments. This is because the protein components of HDL were same on all treatments.

In general, protection of unsaturated fatty acids in fish oil consistently lowers blood lipid profiles; this is in accordance with the opinion of Engle et al (2000) which states that, poly unsaturated fatty acids (PUFA) affect hepatic gene transcription, thus affecting the metabolism of fat. Ω = 3 (PUFA, n = 3) down regulated sterol regulatory binding protein - 1 mRNA and sterol regulatory binding protein release from the endoplasmic reticulum, which affect lipogenic gene transcription. Ω - 3 bond with activated proliferators peroxisomee recepto - α increases lipoprotein lipase trascription so triasil glycerol catabolism faster.

Average of body weight gain over the period of data collection are presented in Table 2.

Table 2. Body weight gain averaging over the period of data collection

Treatment	Body weight Gain (g/day)
R0	36.11 ± 2.41^{a}
R1	43.06 ± 2.40^{b}
R2	50.00 ± 2.01^{c}

Description: ^{ac} Superscript different in the same column showed very real differences (P<0.01)

Based on the results of analysis of variance, fish oil supplementation protected by calcium hydroxide gave very real differences (P < 0.01) of the body weight gain. The average of the highest body weight gain on protected fish oil supplementation treatment were 50.00 ± 2.01 g/head/day. Whereas fish oil supplementation in the treatment gives a lower value is 43.06 ± 2.40 g/head/day, although values tended to be higher when compared to the control treatment 36.11 ± 2.41 g/head/day.

The body weight gain on oil supplementation treatment tended to produce greater when compared to the control treatment, because oil has a caloric value of 2.25 greater when compared with carbohydrate calories, because oil has a balance of carbon and hydrogen with oxygen greater than carbohydrates , so it has the oil level low oxidation (Parakkasi, 1999). The high energy produced by the fat, then carbohydrates and proteins that should be degraded to energy deposited in the body, so the body weight increases. While oil supplementation protected tend to give higher values when compared with oil supplementation without protected. This is because the oil protected by Ca does not interfere with the activity of rumen microbes that feed degradation and more optimal nutrient absorption.

This is supported by the results of the study Joshep (2007) stated that the addition of 5% fish oil protected the sheep give the body weight gain reaches104g/head/day and the addition of 10% to 106 g/head/day. The results provide the body weight gain value is lower than the results of the study Joshep (2007) due to the same type of animal experiments in which the body weight gain is also not influenced by the type of livestock.

CONCLUSION

It was concluded that supplementation of fish oil protected by calcium hydroxide (P2) decreased the highest cholesterol (13.67 ± 7.02 mg/dl) and LDL (1.33 ± 1.53 mg/dl) and increased the highest of HDL (0.33 ± 1.15 mg/dl) and body weight gain (50.00 ± 2.01 g/day).

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Differences in The Quality Of Feed on Blood Glucose Levels, Production and Quality Of Milk in Dairy Cattle

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ABSTRACT

This study aims to determine the effect of different feed quality on blood glucose levels, production and quality of milk in dairy cattle. The material used in this study are 9 Friesian Holstein dairy cows with a weight range of 350-400 kg , lactation levels I-III , divided into 3 treatment groups feed are: T0 = 70% forage of corn + concentrate 30% (14% CP); T1 = Forage of Corn 60% + 40% concentrate (17% CP); T2 = Forage of Corn 50% + 50% concentrate (20% CP). This research method used a Randomized Block Design. Data were analyzed by analysis of variance. The average consumption of dry matter T0, T1 and T2 respectively 11,95, 11,08 and 10,29 kg. The average blood glucose concentration at T0, T1 and T2 respectively 53,00, 49,33 and 57,67 mg/dl. The average production of milk at T0, T1 and T2 respectively was 13,60, 16,67 and 17,37 kg. The average fat levels and fat content of milk on the T0, T1 and T2 respectively 4,8; 4,67; 3,68% and 0,65, 0,63 and 0,64 kg. Average protein levels and protein content of milk on the T0, T1 and T2 respectively was 3,56; 3,48; 3,45% and 0,48; 0,57 and 0,59kg. Average lactose levels and lactose content of milk on T0, T1 and T2 respectively was 4,85; 4,69; 4,58% and 0,60, 0,84 and 0,78kg.
The conclusion from this study is the feeding with different quality (crude protein content of 14%, 17% and 20%) did not significantly affect blood glucose levels, milk production and milk quality in dairy cows

Key Words: Feed, Blood Glucose, Production Milk, Quality of Milk

INTRODUCTION

In some areas in Indonesia mostly dairy cow population has shown a fairly high production performance. Measurement of productivity of dairy cows in milk production aspect is based on the ability of a cow to produce milk and quality of milk produced. The needs of both concentrate feed and forage in dairy cows is very important to prepare for milk production during lactation in connection with increased production and quality of milk. This relates to the energy derived from the feed material. The nutritional requirements of dairy cows in the early period of lactation is very high especially energy needs, where the cows in this period is usually in deficit of energy due to the intake of feed that the maximum is not reached, so as to anticipate the cow will mobilize energy reserves of the body resulting in weight loss.

The nutritional requirements are high in the early period of lactation difficult to meet through the addition of concentrate consumption, because the theory in practice does not support the physiological processes of livestock feed, especially the metabolic processes in the rumen that is normal. The addition of concentrate will cause low rumen pH and crude fiber digestibility decreased so that low forage consumption and resulted in the rumen acidosis. Real effect of the administration of the concentrate in large numbers is a decrease in milk fat content, which in turn has an impact on the quality of milk produced. Potential lactation addition affected by the secretors cells are also influenced by the substrate feed milk as a raw material derived from feed consumed both forage and concentrates. Adequacy standards microbes need to be able to perform its function one of them is generating Volatile Fatty Acids (VFA) where the VFA is one of the raw materials for the synthesis of milk.

Focused on these things, then it would need to be done manipulation of feed to increase production while maintaining the quality of milk produced by feeding with different quality in dairy cattle and see its effect on blood glucose levels, production and quality of milk. The hypothesis in this study is: differences in the quality of feed given to the dairy cows will have an effect on levels blood glucose, the production and quality of milk produced.

MATERIALS AND METHODS

Research Material

Animal

Nine Friesian Holstein dairy cows were used as research materials with average body weight of 350-400 kg at the level I-III lactation. The cows are placed in individual cages measuring 1.5 x 2 meters which are equipped with a food and drink. Nine dairy cows were divided into 3 treatment groups feed.

Feed

Feed used in this study were forage and concentrates. Given forage crop corn is chopped. Comparison Forage : Concentrate (BK) = 70:30; 60:40; and 50:50. Concentrate consisting of a mixture of pollard Wheat, soybean meal. The composition of the concentrate in the study was shown in Table1.

Table 1. Composition of research feed materials

Treatment	Forage	Concentrate	Pollard Bran	Corn Meal	Soybean Cake	Coconut Skin	Soybean	Total
				%				
T0	70	30	32,4	12,6	20	23	12	100
T1	60	40	15	10	30	30	15	100
T2	50	50	7	5	35	35	18	100

Table 2. Composition of research feed nutrition

Treatment	Dry Matter	Crude protein	TDN	Ca	P
			Kg		
T0	11,95	1,38 (14%)	8,02 (67%)	0,099	0,033
T1	11,08	1,49 (17%)	7,41 (66%)	0,087	0,033
T2	10,29	1,74 (20%)	7,19 (69%)	0,088	0,040

Research Methods

The study was conducted using a randomized block design with 3 treatments and 3 replications. Treatment of feed as follows:

1. T0: Forage of Corn (70%): Concentrated (30%) with CP content of 14%
2. T1: Forage of Corn (60%): Concentrated (40%) with CP content of 17%
3. T2: Forage of Corn (50%): Concentrated (50%) with CP content of 20%

The samples of cow were selected using purposive sampling. It means that samples selected with certain criteria, namely: (1) Cows are at lactation level I-III, (2) the average weight ranges from 350-400kg.

Implementation of Research

This research was conducted in two stages:

1. Adaptation period during 2 weeks,
   During adaptation period, gradually feed accustom cows consume feed according to treatment and each cow got appropriate amount of calculation.
2. Treatment during 8 weeks
   a) To measure daily feed intake in cows treated T0, T1 and T2. Consumption of the feed is measured by weighing the amount of feed given reduced residual feed.
   b) To measure production of milk daily, weekly until the end of the study
   c) To analyzed milk samples for fat, protein and lactose for every 2 week
   d) Take blood samples 1 times that in the last week of treatment is 3 hours after feeding, blood samples were used for analysis of blood glucose levels

Parameter Observed:

The parameters observed during the study were:

1. Feed Intake
2. Milk Production
3. Quality of milk includes milk fat content, protein content of and lactose content
4. Blood Glucose Levels

Data Analysis

Data obtained include feed intake, blood glucose levels, milk production and milk quality (fat content, protein content, lactose content) were analyzed by analysis of variance, and if there are differences among the treatments will be continued with Duncan test.

RESULTS AND DISCUSSION

Dry Matter, TDN, and Crude Protein Consumption

The average consumption of dry matter (DM), TDN and crude protein (CP) of cows in each treatment shown in Table 3.

Table 3. Average consumption of DM, TDN and Crude Protein (kg) In each treatment

	Treatment		
	T0	T1	T2
Dry Matter	11,95[a]	11,08[a]	10,29[a]
Total Digestible Nutrient	7,19[a]	8,02[a]	7,41[a]
Crude Protein	1,38[a]	1,49[a]	1,74[b]

[a,b] Different superscript on the same line indicate significant differences (P <0.05)

Table 3 shows that the average consumption of BK of each treatment was T0 = 11,95 kg, T1 = 11,08 kg, and T2 = 10,29 kg. Average consumption of TDN of each treatment was T0 = 7,19 kg, T1 = 8,02 kg, and T2 = 7,41 kg. The average consumption of CP was T0 = 1,38 kg, T1 = 1,49 kg and T2 = 1,74 kg. Statistical analysis showed that the average consumption of DM and TDN in all three treatments had no significant difference (P> 0.05). Feeding with different protein levels has not been able to give effect to the DM and TDN consumption. Sanh et al, (2000) suggests that the higher the level of crude protein (CP), the feed palatability and digestibility of feed increases. Statistical analysis showed that the consumption of CP in the three treatments showed significant differences (P <0.05). Feeding with different protein levels was influential on the amount consumed PK. The highest crude protein consumption (CP) was found in T2 because the protein content of feed on the treatment was highest in the T2 (20%) while the T1 and T0 respectively 17% and 14%.

Blood Glucose Concentration

The average blood glucose concentration of each treatment are shown in Table 4.

Table 4. Average Blood Glucose concentrations for each treatment (mg/dl)

Group	Treatment		
	T0	T1	T2
1	46,00	58,00	58,00
2	55,00	40,00	51,00
3	58,00	50,00	64,00
Average	53,00a	49,33a	57,67a

[a,b] Different superscript on the same line indicate significant differences (P <0.05)

In Table 4 shows that the blood glucose concentration in each treatment T0 = 53.00 mg / dl; T1 = 49.33 mg / dl; T2 = 57.67 mg / dl. This is in accordance with the opinion of Wulandari (2005) that normal blood glucose concentrations ranging from 40-70 mg / dl. Statistical analysis showed that the average blood glucose concentration among the three treatments (T0, T1 and T2) shows no differences (P> 0.05). Giving a different protein feed in the third treatment glucogenic expected availability of substrate in the form of propionic acid may increase significantly. Increased protein levels in T0, T1 and T2 has not shown any significant differences in blood glucose concentrations produced. This is due to the protein level of feed consumed TDN has not been able to increase the consumption resulting concentration of propionic acid as a precursor of glucose are no different. At T2 treatment of blood glucose concentrations tend to be higher than the T1 and T0 this is because the proportion of forage: concentrate on T2 higher at 50:50 than T1 = 60: 40 and T0 = 70: 30. That is the T2 treatment given amount of concentrate more so that the glucose levels are also relatively high.

Milk Production

The average milk productions of dairy cows in each treatment are shown in Table 5.

Table 5. Average milk production (kg) in each treatment

Group	Treatment		
	T0	T1	T2
1	14,41	14,32	11,94
2	14,42	18,37	20,15
3	11,98	17,33	20,00
Average	13,60a	16,67a	17,37a

[a,b] Different superscript on the same line indicate significant differences (P <0.05)

In Table 5 shows that the average production of milk in each treatment T0 = 13.60 kg; T1 = 16.67 kg; T2 = 17.37 kg. Statistical analysis showed that the average milk production in the three treatments (T0, T1 and T2) showed no differences (P> 0.05). Differences in protein feed cannot increase blood glucose levels, blood glucose which is a precursor of milk lactose. In Table 5 showed, at treatment T2 glucose levels tend to be higher than T0 and T1 and T2 milk production at relatively higher than T1 and T0.

In Table 5 shows increasingly high proportion of the concentrate : forage (T2 = 50:50), milk production is likely to increase even though the three different treatments are not real. Chaturvedi et al (1973) stated that improving the quality of the feed easily digestible can increase propionic acid

in the rumen and propionic acid is a precursor of glucose, so the increase in propionic acid will be followed by increased blood glucose.

Levels of Fat Milk and Milk Fat Content

The average fat content of milk and milk fat content in each treatment are shown in Table 6.

Table 6. Average milk fat (%) and the fat content of milk (kg) at each treatment

Group	Treatment		
	T0	T1	T2
Milk Fat (%)			
1	4,96	5,60	3,36
2	4,96	3,80	3,84
3	4,80	4,62	3,85
Average	4,80	4,67a	3,68a
Milk Fat Content (Kg)			
1	0,71	0,40	0,42
2	0,68	0,69	0,77
3	0,57	0,80	0,77
Average	0,65a	0,63a	0,64a

[a,b] Different superscript on the same line indicate significant differences (P <0.05)

In Table 6 shows that the average milk fat in each treatment T0 = 4.80%; T1 = 4.67%; T2 = 3.68%. Statistical analysis showed that the average milk fat on the three treatments (T0, T1 and T2) showed no differences (P> 0.05). This is due to the availability of substrates for synthesis of milk fat (blood glucose) was also not significantly different. Giving different feed protein level have not been able to increase blood glucose concentrations. Soetanto (1994) argues that every gram of fat requires milk produced 0.22 grams of glucose.

In Table 6 shows that the average fat content of milk in each treatment T0 = 0.65 kg, 0.63 kg = T1, T2 = 0.64 kg. Statistical analysis showed that the average fat content of milk on the three treatments (T0, T1 and T2) showed not significantly different (P> 0.05). In Table 7 shows that the milk fat content in T2 tends to be lower than T1 and T0, this is due to the proportion of forage in the T2 least lower than T1 and T0 is 50: 50 (T1 = 60: 40, T0 = 70: 30). The higher the proportion of forage given the higher levels of fat because the digestibility of crude fiber will produce a higher proportion of acetic acid. In the subsequent process of acetic acid is the main raw material milk fat formation.

Levels of Protein Milk and Milk Protein Content

The average levels of protein milk and milk protein content in each treatment shown in Table 7.

In Table 7 shows that the average milk protein (%) in each treatment T0 = 3.56%; T1 = 3.48%; T2 = 3.45%. Statistical analysis showed that the average milk protein on the three treatments (T0, T1 and T2) showed no differences (P> 0.05). This suggests that feeding with different protein levels have not been able to increase the protein content of milk. CP consumption at T0, T1 and T2 showed significant differences (P <0.05) respectively T0 = 1.38; T1 = T2 = 1.49 and 1.74 kg, but this difference did not affect the protein content of milk. This is in accordance with the opinion of Macrae and Reeds (1980) that the protein consumed is not fully utilized by animal.

In Table 8 shows that the average protein content of milk in each treatment T0 = 0.48 kg, 0.57 kg = T1, T2 = 0.59 kg. Statistical analysis showed that the average protein content of milk on the three treatments (T0, T1 and T2) showed no differences (P> 0.05). The protein content of milk at T2 tends to be higher than the T1 and T0. This is caused by the consumption of feed PK at T2 is higher

than T1 and T0, but the differences have not been able to feed PK consumption showed significant differences in the protein content of milk.

Table 7. Average milk protein (**%)** and milk protein content (kg) at each treatment

Group	Treatment		
	T0	T1	T2
Protein Milk (%)			
1	3,65	3,47	3,54
2	3,51	3,36	3,34
3	3,54	3,63	3,48
Average	3,56a	3,48a	3,45a
Milk Protein Content (kg)			
1	0,52	0,49	0,42
2	0,49	0,61	0,67
3	0,42	0,62	0,69
Average	0,48a	0,57a	0,59a

[a,b] Different superscript on the same line indicate significant differences (P <0.05).

Levels of Lactose Milk and Milk Lactose Content

The average level of lactose milk and lactose content of milk in each treatment shown in Table 8

Table 8. Average lactose content of milk(**%)** and lactose content of milk (kg) at each treatment

Group	Treatment		
	T0	T1	T2
Lactose Milk (%)			
1	5,02	4,36	4,91
2	4,77	4,63	4,57
3	4,78	5,07	4,27
Average	4,85	4,69	4,58
Milk Lactose Content (kg)			
1	0,72	0,80	0,58
2	0,67	0,85	0,92
3	0,42	0,87	0,85
Average	0,6	0,84	0,78

[a,b] Different superscript on the same line indicate significant differences (P <0.05)

In Table 8 shows that the average milk lactose (%) in each treatment T0 = 4.85%; T1 = 4.69%; T2 = 4.58%. Statistical analysis showed that the average milk lactose on the three treatments (T0, T1 and T2) showed no differences (P> 0.05). Feeding with different protein levels has not been able to increase the concentration of blood glucose, so it can not increase the lactose content of milk. Blood glucose is the main precursor for the formation of milk lactose.

In Table 8 shows that the average content of milk lactose in each treatment T0 = 0.60 kg, 0.84 kg = T1, T2 = 0.78 kg. Statistical analysis showed that the average lactose content of milk on the three treatments (T0, T1 and T2) showed no differences (P> 0.05). Feeding with different protein content have not been able to increase the levels of lactose of milk and milk production. The lactose content of milk in all treatments did not show any significant difference because blood glucose

concentrations in the three treatment also had no significant, which is why the content of milk lactose not significant.

CONCLUSION

Based on the results of this study concluded that feeding with different quality (protein content of 14%, 17% and 20%) did not significantly affect blood glucose levels, production and quality of milk produced. Feed with 20% protein content tends to give a response of milk production and better quality.

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The Nutrients Potential of Agricultural Waste as Feed of Ruminants in Southeast Sulawesi

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ABSTRACT

The developments of ruminants' production have to support by feed availability either in quantity or in quality. Problems of providing feeds in Southeast Sulawesi were limited land for forage cultivation and season fluctuation. Agricultural and plantation waste have great potential to use as alternative ruminant's feed. This research was aimed to analyze the nutrients potential of agricultural waste in Southeast Sulawesi as ruminant feed. The data obtained can be used as a reference for the formulation of rations of ruminants' maintenance, production, and reproduction nutrition based on its genetic potential. The observed variables were water content, crude protein, crude fat, crude fiber, and total digestible nutrient (TDN). The results showed that the higher protein content were obtained from kapok seeds (27,71%), followed by tofu waste (21.73%), groundnut shell (19.53%). Meanwhile high crude fiber were obtain from groundnut shell, cacao pods, and rice straw, respectively 35,63, 32.23 and 31.64%.

Key words: ruminant, agricultural waste, nutrients, crude protein, crude fat, and TDN

INTRODUCTION

Ruminant livestock production especially beef cattle still low. It is characterized by the number of beef cattle production cannot fulfill the domestic consumption. Indonesia has high number of beef cattle import over the years. The main reason caused low production of ruminants was feed availability. Therefore, to increase ruminant production should be followed by a production of forage both in quantity as well as quality. Fluctuation forage production was determined by season. High forage production in the rainy season, but sufficient during the dry season. Forage production decreased and cannot fulfill ruminant nutritional needs to express its genetic potential to the maximum. In addition, the production of forage is also determined by the availability of sufficient land for pasture grazing and cut and carry forage cultivation system.

The low land availability as forage source of cattle due to housing purpose and farmers choice to grow crops that can be beneficial to human needs (Samadi et al, 2010). Strategies that can be done to overcome various limitations ruminants feed are to develop integrated livestock – food crops – plantations. Integration between food crops with livestock is an alternative to increasing the population of cattle. The application of this system is a system that cattle can get an alternative feed from agriculture and plantations waste (Zainuddin et al., 1983). Agricultural wastes are cheap feed source that it can be used as substitution feed for ruminant livestock (Prasetyo et al. (2006).

The source of the agricultural waste obtained from food crops commodity, which is the availability affected by planting patterns and its extensive acreage area (Syamsu et al. 2003). Types of agricultural waste that can be utilized as feed source is corn straw, rice straw, soybean straw, peanuts, cassava, and sweet potatoes waste.

Some types of agricultural waste as potential feed ingredients with great number of availability and easily obtainable in Southeast Sulawesi were rice straw, sago waste, rice bran, cocoa pod, ground nuts shell, corn cobs, and kapok seed.. However, to be able to utilize agricultural waste

as a source of alternative livestock ruminant feed is need to knowing the potential of nutrition of each kind of waste. There has been no clear information about nutrient potential of agricultural and plantation waste in Southeast Sulawesi. Therefore the analysis needs to be done to explore the potential of agricultural waste by taking samples in several districts.

MATERIAL AND METHODS

This research uses descriptive method continued by simple statistical analysis. Data collection and documentation were obtained form of secondary data. The sampling locations were four regency in Southeast Sulawesi, they were Kendari, Muna Regency, Southern Konawe Regency, and Konawe Regency. Agriculture and plantations waste that used as sample were fine rice bran, tofu waste, cocoa pods, sago waste, corn cobs, groundnut shell, and kapok seed. Sampling method of each areas were taken two samples for each type of waste, so that the retrieved 8 samples for each type of waste. Each sample was analyzed nutritional potential value using proximate methods. The observed variables are; (1) moisture content, (2) Crude protein, (3) Crude fat content, (4) Crude fibers, (5) and Total Digestible Nutrient (TDN). Compositional analyses standard methods according to AOAC (2000) were used in this research.

RESULTS AND DISCUSSION

Rice straw is the rest of harvesting rice consisting of stems and leaves. Quality of rice straw showed in table 1. The average crude protein content of was 5.44%, crude fat, 1.35%, crude fiber 31.64% and TDN 53.56%.

Table 1. Average Nutritional Content of Agricultural Waste

Material	Moisture content (%)	Crude Protein (%)	Crude Fat (%)	Crude Fiber (%)	TDN
Rice straw	5.44	3.98	1.35	31.64	53.56
Fine Rice Bran	8.56	7.34	4.43	14.86	62.23
Coarse Rice Bran	7.36	7.30	3.88	16.88	58.76
Tofu Waste	6.89	21.73	3.65	20.70	71.90
Cocoa Pod Husk	7.33	6.93	2.99	32.23	55.36
Corn Cob	4.80	3.07	0.20	29.05	56.01
Ground Nut Shell	7.85	19.53	0.78	35.63	51.99
Kapok Seed	7.58	27.71	8.39	28.75	63.39

Similar observations were made by Herawati, et al. (1988) and Murni et al, (2008) that states protein content of rice straw was range from 4 - 7% with ADF, 41-56%, TDN 43 - 54%, and 80.8% dry matter. The cellulose and hemicelluloses content were 47.54%, and 10,67% respectively. Rice straw digestibility was relatively low due high silica content (8-14%). The results of the analysis by Prasetyo, et al (2006) showed that rice straw dry matter , crude fat, crude fiber, crude protein, BETN and metabolism energy were 86.00; 18.20; 1.50; 30.90; 3.44; 32.20% and 1.180 Mkal/kg respectively. These result were also supported by Wahyono and Ruly Hardianto, (2004) who reported that dry rice straw contains crude protein, crude fat, crude fiber, TDN were 31.867; 5.211; 26.779 and 51.496% respectively. Rice straw benefits in beef cattle rations is source of feed fiber, so it can serve as basal feed. Crude fiber that is consumed will be fermented by rumen microbes to produce volatile fatty acids as energy source and to supply-chain carbon (Arora, 1989). Feeding only rice straw does not provide enough nutrients to the ruminants to maintain high production levels, it is due to the low nutritive value of this highly lignified material (Sarnklong, et al, 2010).

Fine rice bran is a by-product of rice milling which is usually consist layer of cotyledon bran, small husk and broken rice. Rice bran is a source of energy for livestock, besides as good B vitamin source. The use of rice bran in rations was as filler material that makes feed more bulky and does not have high density, source of crude fiber which needed by poultry digestive systems to improve efficiency and contributes energy given its high fat content. The results of the analysis in table 1 shows fine rice bran have average 8.56% water content, 14.68% ash, 7.34% crude protein, 4.43% crude fat, crude fiber 14,86%, Ca 0.33%, and PO_4 1.05% (Hartadi, Reksohadiprodjo, and Tillman, 1993). Rice bran crude protein content ranges from 7.6%, crude fat has an extensive range of approximately 7-19%, 27.8%, of crude fiber, BETN 44.7% and ash 16% . Meanwhile analysis results showed coarse rice bran have 7.30% crude protein, 3.75% crude fat, 16.88% crude fibre, 0.24% Ca, 1.09% PO4, 15.58% ash and 7,36% moisture content. Wahyono and Ruly Hardianto, (2004) also reported that coarse rice bran contains dry matter 91.267%, crude protein 9.960 %, crude fat 2.320 %, crude fiber 18.513% and TDN 55.521%.

Tofu waste is solid waste from tofu factories. Tofu waste the result of the follow-up process of making tofu, obtained from boiling residue soybean slurry which has durability no more than 24 hours in open space (team Fatemata, 1981). The results of the analysis of table 1 shows crude protein content or other nutritional substances from dried tofu waste were 21.73% crude protein, 3.65% crude fat, 20.70% crude fiber, 2.29% ash, 0.77% Ca, 0.77% PO4 and 6.89% water content. In other research, according to Wahyono and Ruly Hardianto, (2004) dried tofu waste contains 10.788% dry matter, 25.651% crude protein, 5.317% crude fat, 14.527% crude fiber, and 76.0% TDN.

Laboratory of Nutrisi Ternak Ruminansia dan Kimia Makanan Ternak, Livestock Husbandry Faculty of Padjadjaran University (2006) nutritional of tofu waste contains 22.64% crude protein, 6.12% crude fat, 22.65% crude fiber, 2.62% ash, 0.04% Ca; 0.06%; P and 4010 kcal/kg gross energy. According the composition and nutritional content of tofu waste, it can used as protein source of feed. The tofu waste could be given to livestock in the wet form. Feeding tofu waste to Muscovy duck already practices by farmer (Tanwiriah, et al, 2006). Tofu waste fermentation through the ensilage process using the Bacillus amyloliquefaciens bacteria can improve its nutritional value. Tofu waste raw material has high moisture content (90.04 %) so that it is perishables and has short shelf life. However, the crude protein content in tofu waste is quite high (34,94%) and is potentially used as either ruminants or poultry feed through fermentation (Anggraeni, 2013).

Cocoa pods husk is agriculture industrial waste on cocoa (Theobroma cacao l.) processing. Cocoa fruit composed of 74% of the skin (pods) of the fruit, the placenta 2% and 24% was the seeds. Proximate analysis results in table 1 shows nutrition value of cocoa pods, that contain 0.93% crude protein, 2.99% crude fat, 32.23% crude fiber, 0.85% Ca, 0.05% PO4, 13.02% ash and 7.33% moisture content. Daud et al. (2013) reported that ash and moisture content of cocoa pod are 12% and 14% respectively. Nasrullah and Ella (1993), reported that cocoa pod contains 22% crude protein and 3 - 9% crude fat. Other experiment expressed the cocoa pod nutrition content consists 88% of dry matter, 8% crude protein, 40.1% crude fiber and 50.8% TDN and its application on ruminant livestock trough 30-40% (Wawo, 2008). Cocoa pod husk will enhance increase in the use of waste cocoa by-products, poultry farmers' income and reduction in feed production cost in Nigeria (Eghosa, et al, 2010). However, cocoa pod husk may be possible to feed fresh cocoa pod husk at a higher level. The problem with this will be the high cost of the concentrate to go with the higher level of fresh cocoa pod husk (Oddoye, 2010)

Proximate analysis results indicate that nutritional content of corn cob was 3.07% crude protein, 0.20% crude fat, 29.05% crud fiber, 1.69% Ca, 0.06% PO_4, 2.15% ash and 4.80% moisture content. Krishna, et al., (2006) reported dried corn cobs contain 72.42% dry matter, 3.85% crude protein, 27.53% crude fiber and 52.80% TDN. While according to Faesal (2013) that dried corn cobs contains cob 87% dry matter, 83% TDN, and 9.0% crude protein.

Ground nut shell proximate analysis results shown that the crude protein content was 19,53%, 0.78% crude fat, 35,63% crude fiber, 1.38% calcium, 0.32% PO4, 4.59% ash and 7,85% moisture content. Wahyono and Ruly Hardianto (2004) reported that ground nut shell contain

87.36% dry matter, 5.769% crude protein, 2.511% crude fat, 73.369 crude fiber, and 31.700% TDN. The last material was kapok seed, which based on the results of the analysis of table 1 have nutrition value as below; 27.71 crude protein, 8.39% crude fat, 28.75% crude fiber, 0.52% Ca, 0.42% PO4, 6.45% ash and 7.58% moisture content.

CONCLUSION

The agriculture and plantation waste in Southeast Sulawesi has potency of nutritional for ruminant feed. Tofu waste, kapok seeds and ground nut shell has the potential of nutrition as protein source. Utilization of agricultural waste such as rice bran, corn cobs, ground nut shell, kapok seed, etc should be formulated with other feed ingredients to meet the daily maintenance, production and reproduction of ruminant requirement.

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The Supplementation Effect of Turmeric (*Curcuma domestica* Vahl.) and Brotowali (*Tinosporacrispa* L. Miers) Extract on Broiler Meat Quality

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ABSTRACT

The usage of natural feed additive be expected can increase meat quality and broilers performance. This research was aimed to study interaction effect of turmeric and brotowali extract feed supplementation on broiler meat quality.300 birds of Cobs broiler strain were used and separated on 50 pens with 6 birds each pen and maintained until 42 days old. The research was use factorial complete randomized design with first factor was turmeric extract levels (0; 0.2; 0.4; 0.6; and 0.8%), and the second factor was brotowali extract levels (0; 0.2; 0.4; 0.6; and 0.8%), so there was 25 treatment combinations with two replications. The research parameters were meat pH, cooking loss (CS), dry matter (DM), and organic matter (OM). Result of research showed that turmeric and brotowali extract supplementation have significant interaction effect on broiler meat DM content, but does not have effect on pH, CS, and OM content. Combination of 0.4% turmeric and 0.2% brotowali extract supplementation was provide highest DM content, meanwhile on individual effect, supplementation turmeric at 0.4% level has significant effect on SC parameter.

Key Words: Turmeric, Brotowali, Broiler, Meat Quality

INTRODUCTION

Broiler is familiar meat produce poultry in Indonesia. Customer selection of broiler tends to increase, when they prefer quality, soft, delicious, and low fat/ cholesterol meat (Kim et al. 2009). This issue was stimulating broiler farmers to use high quality, useful, high availability, easy to get and low cost of feed additive to produce safety consumed meat. Indonesia have abundant natural feed additive from medical plants to be used increasing broilers meat quality, two of them were turmeric and brotowali.The intended of feed additive application was to improve feed efficiency, production and poultry quality. Generally, feed additive which used was synthetic antibiotic. The excessive usage this type will be headed on antibiotic resistance, antibiotic meat residue, and hazardous on consumers. Commercial feed additive generally composed by synthetic compounds, that have harmful side effect, such as spoil of hormonal and immunity system (Cao et al. 2004).

Several research were conducted to substitute the usage of synthetic feed additive which can maintain even increase poultry health and production, one of them was utilized plant based natural antibiotic/phytobiotic. Turmeric (Curcuma domestica Vahl.) is type of plant that can use to substitute synthetic antibiotic because it's active and bioactive compound have similarities function with this synthetic one. Based on Rukmana (2001), curcuminoid compound on turmeric contain curcumin and its derivation having large spectrum of biological activity such as, antibacterial, antioxidant and antihepatotocsic. Brotowali was one of medical plant with natural chemical compound useful for human healthy like diabetic, malaria, hepatitis etc. Brotowali contain berberin, antimicrobial and columbine also others chemical compound as medicine such as, alkaloid, soft resin, glycoside, picroretocyd, picroretin biter, tinocrysposid, and coaculin (Lentera and Kresnadi, 2003).Turmeric and brotowali extract adding on feed be expected increase pH value, cooking shrinkage (CS), dry matter (DM), and organic matter (OM) of broiler meat.

MATERIAL AND METHODS

Research was conducted for 42 days with using 300 birds Cobb 500 broiler strain. The research was use factorial complete randomized design with first factor was turmeric extract levels (0; 0.2; 0.4; 0.6; and 0.8%), and the second factor was brotowali extract levels (0; 0.2; 0.4; 0.6; and 0.8%), so there was 25 treatment combinations with two replications. Based feed in this research was BP-11 Bravo$^{(R)}$ of PT. Charoen Pokphand (moisture content: 13% max; crude protein 21-23%; crude fat 5%; crude fiber 5% max; ash 7% max; and phosphorus 0.6% min).

The turmeric and brotowali extract were obtained from fresh turmeric tuber and brotowali stem material. Material was cleaned by water washing, thin slicing and soaking on 30^{o}C water for 20 minutes before juiced with composition 1:1 (g/g material: water). The obtained solution screened and deposited for two days. The sediment was dried on 60^{o}C oven until dry and milling to get turmeric and brotowali dry extract.

The research parameters were meat pH, cooking Loss (CS), dry matter (DM), and organic matter (OM).

RESULT AND DISCUSSION

Meat pH

pH value of 42 days old broiler meat is presented on Table 1.

Table 1. Broilers Meat pH

Turmeric Levels (%)	Brotowali Levels (%)					Average
	0	0.2	0.4	0.6	0.8	
0	5.33	5.37	5.16	5.33	5.32	5.30
0.2	5.27	5.35	5.31	5.34	5.36	5.32
0.4	5.41	5.10	5.49	5.54	5.35	5.38
0.6	5.44	5.24	5.13	5.27	5.27	5.27
0.8	5.48	5.31	5.44	5.37	4.98	5.31
Average	5.39	5.27	5.30	5.37	5.25	

Based on variance analysis showed that there was no interaction of combination and no significant individual effect (p>.05) of adding turmeric and brotowali extract on broiler meat pH. The pH value of broiler meat in this research about 5.25 – 5.56, and its lower while compare with Abdullah et al. (2010) that state 5.48 – 5.69 and Raharjo et al. (2015) with value 5.55. The result of research categorized as normal pH value of broiler meat.

Cooking Loss (CL)

Cooking Loss of 42 days old broiler meat is presented on Table 2.

Table 2. Broilers Meat Cooking Loss (%)

Turmeric Levels (%)	Brotowali Levels (%)					Average
	0	0.2	0.4	0.6	0.8	
0	15,00	10,00	15,00	15,00	15,00	14,00^{a}
0.2	10,00	20,00	10,00	20,00	15,00	15,00^{ab}
0.4	25,00	30,00	25,00	30,00	30,00	28,00^{b}
0.6	20,00	20,00	15,00	20,00	15,00	18,00^{ab}
0.8	20,00	20,00	30,00	15,00	25,00	22,00^{ab}
Average	18,00	20,00	19,00	20,00	20,00	

Different superscript on same column of table above show significant different (p<0.05)

Based on variance analysis showed that there was no interaction of combination ($p>.05$) turmeric and brotowali extract on broiler meat CL, however there is significant individual effect ($p<.05$) adding turmeric extract on broiler meat CL. The result showed adding 0.40% turmeric extract affected higestCL value (28.00%), it was higher when compare on Prayitno et al. (2010) with value 26.79%. This was suspected due to active compound in turmeric, curcumin and essential oil, which can increase CL value by bonding myofibril protein. The adding of plant extract contain curcumin and essential oil will be capable to increase CL value of broiler meat (Dono, 2010).

Meat Dry Matter (DM)

Meat dry matter percentage of 42 days old broiler meat is presented on Table 3.

Table 3. Broilers Meat Dry Matter (%)

Turmeric Levels (%)	Brotowali Levels (%)					Average
	0	0.2	0.4	0.6	0.8	
0	25.91^{hij}	23.15^{ab}	25.04^{efg}	25.35^{ghi}	25.85^{hij}	25.06
0.2	23.82^{abc}	25.38^{ghi}	24.87^{efg}	25.14^{gh}	25.14^{fgh}	24.87
0.4	25.60^{ghi}	26.78^{ij}	24.1^{cdef}	2.02^{a}	24.85^{efg}	24.87
0.6	24.17^{cdef}	23.88^{abcd}	25.48^{ghi}	26.28^{ij}	24.71^{cdefg}	24.90
0.8	24.77^{defg}	24.80^{defg}	24.02^{bcde}	24.12^{cdef}	25.65^{ghi}	24.67
Average	24.85	24.80	24.70	24.78	25.24	

Different superscript on table above show significant different ($p<.05$)

Based on variance analysis showed that there was interaction significant effect ($p<.05$) of turmeric and brotowali extract adding on broiler meat DM percentage. The best DM percentage was obtained on combination of 0.4% turmeric and 0.2% brotowali extract combination (26.78%). It seems due to turmeric and brotowali extract content, the active compound curcumin, essential oil, flavonoid, tannin and saponin, capable to increase meat DM. In contrast with Estancia et al. (2012), adding turmeric extract as single additive cannot increase DM meat with value 24.69%.

Meat Organic Matter (OM)

Meat organic matter percentage of 42 days old broiler meat is presented on Table 4.

Table 4. Broilers Meat Organic Matter (%)

Turmeric Levels (%)	Brotowali Levels (%)					Average
	0	0.2	0.4	0.6	0.8	
0	95.47	95.34	77.24	9.77	95.10	91.78
0.2	95.00	95.71	52.07	95.63	95.65	86.81
0.4	95.46	95.03	95.46	95.40	94.91	95.25
0.6	94.25	94.59	94.74	95.64	95.68	94.98
0.8	95.13	95.44	94.95	95.33	95.11	95.19
Average	95.06	95.22	82.89	95.55	95.29	

Based on variance analysis showed that there was no interaction of combination and no significant individual effect ($p>.05$) of adding turmeric and brotowali extract on broiler meat OM. Turmeric and brotowali extract adding which contain active compound such as curcumin, essential oil, flavonoid, tannin and saponin, on broiler feed, expected increase feed intake/ consumption and poultry antioxidant. The combination of two extracts didn't affect meat OM. Another research on garlic and temulawak extract combination supplementation, with active compound like as curcumin,

essential oil, flavonoid, tannin and saponin, didn't give any significant effect on broiler meat OM percentage (Dono, 2012).

CONCLUSION

Supplementation of turmeric and brotowali extract have significant interaction on broiler meat DM percentage, but didnt have effect on pH, CL, and broiler meat OM. The best DM percentage was obtained on combination of 0.4% turmeric and 0.2% brotowali extract combination. On individually, turmeric extract have significant effect on CL, which is adding 0.4% was the best level.

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The Adaptability, Biomass Production and Nutritional Value of Introduced Grasses in Timor-Leste

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ABSTRACT

An experiment was conducted and aimed to determine the adaptability, fresh biomass, dry matter and nutritional value of grasses introduced from overseas to Timor-Leste. The experiment was conducted at the Research Center of the Ministry of Agriculture and Fisheries of Timor-Leste is located in Loes, the Village of Guguleur, Sub-District Maubara and District Liquiça. The research material consisted of *Brachiaria hybrid cv Mulato, Setaria sphacelata, Pennisetum purpureophoides* and *Panicum maximum*. The grasses were layouted using Randomized Complete Block Design (RCBD) and each grass was replicated four times. Variables measured consisted of plant height, clump circumferences, fresh biomass and dry matter and nutritional value. Data were analyzed using ANOVA Meta-Experiments and multiple regression analysis. The orthogonal contrast was used to find the treatments that show the significant different effect. The result showed that the precipitation, temperature, solar radiation and relative humidity affected the performance of grass on plant height but did not significant affect in circumference clumps and fresh biomass. Furthermore, those facts were explained in the result of ANOVA Meta-Experiment, where the influence of the season, the type of grass and the interaction between the season and the type of grass showed a highly significant ($P<0.01$) to the fresh biomass. The influence of the season, the interaction of the season and the type of grass have no effect on grass dry matter ($P>0.05$). Although the biomass production is lower, the nutritional values of the grasses do not vary compare to grasses planted in Indonesia. The grasses are suitable for planting and developing in Timor-Leste as animal feed in the future.

Key Words: Adaptability, Biomass, Dry Matter, Nutritional Value, Timor-Leste, Grasses

INTRODUCTION

The development of the livestock sector is the second priority after food crops. The livestock sector plays a very important role especially to increase the added value, source of income and public savings, improve the nutritional deficiencies of protein of animal origin and food security. Although the system of raising animals in Timor-Leste is still dominated by the extensive traditional system of grazing, the priority on livestock (especially cattle, buffaloes and horses) has also helped improve farmland management, facilitate social activities and religious ceremonies as well as for export commodities. In extensive livestock raising, the aspect of sufficiency of required nutrient of livestock was ignored as the needs of livestock entirely depends on the availability of natural pasture whose quality is so poor to be consumed by livestock (Suhubdy, 2013). Nulik (2009) and Sutedi (2013) reported that another factor responsible for the low livestock production and productivity is the availability of feed in terms of quality, quantity and continuity which is highly dependent on season.

This study aims to identify the adaptability of superior grass in terms of plant height, circumference of the grass clump and the resulting production of fresh biomass and the dry matter

as well as the composition of the nutritional value of the superior grass at the end of the dry season, in the rainy season and at the beginning of the dry season.

MATERIALS AND METHODS

The experiment was conducted at the Research Center of the Ministry of Agriculture and Fisheries of Timor-Leste at Loes, Legulor Sub-village of Guguleur, in Maubara Sub-distrit of Liquica Regency from September 2014 to May 2015 use four grasses; *Brachiaria hybrid* cv Mulato (BM), *Setaria sphacelata* (SS), *Pennisetum purpurephoides* (PP) and *Panicum maximum* (PM). Seeds of those grasses were introduced from Indonesia 2011 and Australia 2012.

This study was conducted using the field experimental method in the rainy season and the dry season. The experimental design used was the Randomized Complete Block Design for 4 types of grass with 4 replications. Plant height (cm) was measured from ground level up to the highest peak of the grass plants. Data on grass growth such-- as plant height, clump circumference was recorded five times, namely 30 days after sowing (DAS), 60 DAS, 90 DAS, 120 DAS and 150 DAS at five times during research period on production of fresh biomass and weight of dry production (%). First data collection was carried out at the end of the dry season which was the first harvest, i.e. 60 days after planting. During the rainy season, data was collected three times on the following harvest days: 40 days after the first harvest in the dry season; 40 days afterward, and another 40 days afterward. Finally, 40 days after the last harvest in the rainy season came the harvest time of the beginning of dry season in which data was collected. The data obtained from the study were analyzed using GenStat 2013 and using the analysis of multiple linear regression between the variables of grass plant growth and environmental adaptability factors such as rainfall (CH = curah hujan), temperature (T), radiation (R), and humidity (K = kelembaban). The Combination ANOVA Analysis (Meta Analysis) was also employed with α = 5%. Variables that showed highly significant effect were further examined with Contrast Test (Gaspersz, 1991, 1995 and Gomez et al. 2010).

RESULTS AND DISCUSSION

Grass Growth

Average grass height increases as the age of grass plants increases shown in table 1. It is indicated that grass plants at the end of the dry season (Ak-MK) was lower compared to the height of the plants in the rainy season (MH) and at the beginning of the dry season (Aw-MK). It is recorded that rainfall in October was 2.40 mm, and 39.20 mm in November. Limited supply of water has directly hindered the growth of the grass plants. Meanwhile, grass plants that obtain sufficient water has thrived. Water shortage with high humidity level has caused water in the soil evaporated quickly and inhibit the growth of the grass plants. Moreover, Guritno (2011); Hasan (2012), Purbajanti (2013), and Sutedi (2013) reported that plant growth is strongly influenced by two factors: genetic factors and environmental factors. Genetic factors can affect physiological development of plants and the environmental factors affect from radiation, rainfall, temperature, soil moisture and nutrients.

The average clumps circumference shown in Table 1 indicates that the increase of size of the circumference of all types of grass clumps follow relatively the same pattern at every change of season. Differences in the size of the circumference of this family is concerned very much with water supply, as seen obviously from the conditions at the dry season compared to those at the beginning of the rainy season. This is evidenced by the data of rainfall in December (233 mm), January (410 mm), February (155.40 mm), and in March (108.60 mm). The relatively same pattern of changes in the size of the clumps of all types of grass indicate a continuous increase of clump circumference at the end of the dry season, during the rainy season and at the beginning of dry season.

Table 1. Average Grass Height and Clumps Circumference (cm)

Grass	Harvest time		
	End of the dry season (Ak-MK)	Rainy season (MH)	The beginning of dry season (Aw-MK)
Height			
Brachiaria hybrid cv Mulato	46.05	111.12	129.53
Setaria sphacelata	42.97	116.75	137.85
Pennisetum purpureophoides	101.46	185.64	251.40
Panicum maximum	75.81	181.67	200.18
Clumps Circumference			
Brachiarai hybrid cv Mulato	18. 85	40. 65	49. 19
Setaria sphacelata	20. 60	37. 06	41. 02
Pennisetum purpureophoides	29. 49	44. 78	58. 81
Panicum maximum	18. 44	35. 32	33. 48

Grass Production

The results indicate that the highest amount of biomass production of the four types of grass was in the rainy season by *Pennisetum purpureophoides* grass (13.49 kg), followed by *Panicum maximum* (7.03 kg), *Setaria sphacelata* (5.57 kg) and *Brachiaria* Mulato (4.4 kg). In the beginning of dry season, the highest amount of biomass production comes from *Pennisetum purpureophoides* (4.65 kg), followed by *Panicum maximum* (3.65 kg), *Brachiaria hybrid* cv Mulato (2.18 kg) and the lowest is from *Setaria sphacelata* (2.1 kg). At the end of the dry season, *Pennisetum purpureophoides* yields the highest (3.37 kg), followed by *Brachiaria hybrid* cv Mulato (1.08 kg), *Setaria sphacelata* (1.03 kg) and *Panicum maximum* (1.00 kg).

Table 2. Average fresh biomass production of grasses in three seasons (kg/m^2)

Grass	Replications		
	End of the dry season (Ak-MK)	Rainy season (MH)	The beginning of dry season (Aw-MK)
Fresh Biomass (kg)			
Brachiaria hybrid cv Mulato	1.08	4.48	2.18
Setaria sepacehelata	1.03	5.57	2.10
Pennistum purpureopohides	3.37	13.49	4.65
Panicum maximum	1.00	7.03	3.65
Dry Matter (%)			
Brchiaria hubrid cv Mulato	14. 38	13. 79	14. 38
Setaria sphacelata	13. 50	13. 33	13. 88
Pennisetum purpureophoides	21. 25	20. 75	24. 38
Panicum maximum	15. 50	15. 29	18. 88

This indicate that in the rainy season is the highest fresh biomass production as adequate water is available and photosynthetic process goes so perfectly that helps plants grow faster, consequently the number of leaves produced increases, more number of tillers grow and circumference of clumps becomes larger (Nuriyasa *et al*., 2012).

Meanwhile, at the beginning and at the end of the dry season water needed by the grass plants to grow and sustain life is very limited and so are the nutrients needed. High humidity has also disturbed the growth of grass plants: the clumps circumference grew small, little number of leaves could be produced, and grass biomass production turned to be low (Lakitan, 2013). However, Sutedi (2013) reported that the difference in results between the rainy season and the dry season is closely related to the physiology of plants and water absorbance and some plants experience vegetative growth during the rainy season and generative growth during the dry season.

Highest dry matter composition was in the end of dry season on the grass type of *Pennisetum purpurephoides (21.25%),* followed by *Brachiaria hybrid cv Mulato* (14.38%), *Panicum maximum* (15.50%) and *Setraria sphacelata* (13.50 %); in the rainy season the highest composition of dry material is on *Pennisetum purpureophoides* (20.75%)*,* followed by *Panicum maximum* (15.29%)*, Brachiaria hybrid cv* Mulato (13.79%) *Setaria sphacelata* (13.33%)*;* finally at the beginning of dry season the highest dry matter composition is in the grass type of *purpurrephoides Pennisetum,* followed by *Panicum maximum, Brachiaria hybrid cv Mulato* and *Setaria sphacelata.* These results indicate that the young grass plants with low frequency of defoliation at the end of the dry season yield less fresh biomass and more dry matter grass. In the rainy season, the heavy rainfall (233mm-410mm) helps increase the production of fresh biomass and high crude protein but low in dry matter. Meanwhile in the early dry season, rainfall begins to decrease, defoliation increases, the production of fresh biomass decrease, and consequently production of dry matter becomes high. These results are in line with reports made by Correia (2009) in way that frequent defoliation occurrences can often increase the crude protein content but lower the content of dry matter. Also, Sutaryono and Partridge (2000) reported that continuous defoliation occurrences can result in reduced root system and clumps become smaller and production turns to be low.

Grass Nutritional Value

The composition of the nutritional value obtained from the research and analysis of samples in the laboratory showed that crude protein, digestibility of dry matter, ADF and digestibility of organic matter is still low compared with previously research in outside of Timor-Leste, while the content of crude fat, crude fiber and NDF obtained more high in this research.

Table 3. Grass Nutritional Value (% DM)

Type of grasses	DM	CP	CFat	CF	Ash	OM	NDF	ADF	ИD	OMD
Brachiarai hybrid Mulato	90.38	7.27	2.66	31.84	10.51	95.64	71.70	46.14	57.51	57.18
Setaria spachelata	91.17	9.86	2.77	45.40	12.98	96.71	71.68	43.32	55.17	53.19
P. purpurephoides	90.25	10.52	1.80	49.78	13.24	97.56	74.26	43.57	59.61	57.96
Panicum maximum	90.99	10.07	2.25	45.16	10.60	99.30	76.04	43.84	48.61	50.97

This is consistent with reports from (Hasan, 2012 and Lakitan, 2013) that the soil condition, nutrient of soil, environment factor and water supply affects the nutritional value produced, while Utomo (2012) reported that the age of defoliation good is ahead of flowering, having reached the optimal production in terms of the content of dry matter, crude protein, crude fiber, vitamins and minerals and protein production forage achieve optimum point and the content of crude fiber is still normal. Besides, Suswati *et al*. (2012) that the older the plant, the less nutritional value of forage that is due to the high ratio between the stem of the leaf.

CONCLUSION

Variables of plant growth and grass production was studied in this research contributes very significant effect on plant height, grass clump circumference, fresh biomass production and dry

matter. Environmental factor that mostly affect the adaptability of the grasses is the precipitation variable while other environmental factors (temperature, radiation and humidity) contribute a relatively low effect.

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Identification of Weed and Their Potency as Forage

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ABSTRACT

The weeds are secondary vegetation or pioneer plants growing on agricultural land and fallow land. On agriculture, the weed that grows on the cultivation land was considered always harmful and should be eradicated. However, weeds can be managed properly so that it can provide valuable economic benefits, especially for the breeders. The aim of this study was to identify the kinds of weeds that have the potential as forages. The method used in this study are: (a) Model Participatory Rapid Appraisal (PRA) means for identifying the kinds of weeds that have the potential as forages which involves breeders on research location, (b) method of pot culture which is soil sterile (free weed seeds) mixed with cow manure that allegedly contains weed seeds, then grown in seedling trays. The kinds of weeds that grow furthermore be identified by type, species and families. The results of research showed that there are 20 species from broadleaf weeds, 10 species from grasses weeds and 2 species from sedges have potential as forages.

Key Word: Weed, Forage, Livestock, Breeder, Economic Benefits

INTRODUCTION

The green forage livestock is an important factor in increasing livestock production. On the other hand, the limitations of animal forage increasingly perceived because of land conversion into a new residential and practices breeders or farmers who cultivate forage on marginal land. On the marginal land more than 80% of farmers planting conventional manner with the characteristic shifting cultivation (Halim, 2010). In this condition, many kinds of weeds that are considered always harmful and disturbing human interests during land clearing, when the plants grow as well as abandoned fields (Ozzie *et al*., 2009).

A bad connotation against weeds nuisance of cultivation of planting, should have to be minimized by managing weeds wisely so that weeds can provide valuable economic benefit, especially for the breeders. One of aspect is the use of weed as forages. The traditional breeders who raise cattle usually take several weeds or grasses as forages from generation to generation without any management of forage and good maintenance (Asih, 2004). The use of weeds as forage was still limited to certain kinds of weeds and it is just to control weeds directly. According Chee and Faiz (2000), that's to exploiting weeds as forages not only can cope with forages production quality but can be biological control of weed. Thereby, identifying weeds for forage is very important to be done.

MATERIAL AND METHOD

The materials that used in this study were soil sterile, water sterile, seedling trays, cow's manure and agricultural tools. The methods that used in this study were: (a) Model Participatory Rapid Appraisal (PRA) means for identifying the kinds of weeds that have the potential as forage which involves breeders on research location, (b) method of pot culture which is soil sterile (free weed seeds) mixed with cow manure that allegedly contains weed seeds, then grown in seedling trays. The kinds of weeds that grow furthermore be identified by type, species and Families.

RESULT AND DISCUSSION

The results of research showed that there were three groups of weed and 10 Families. The kind of weed consist of 20 species from broad leaved weeds, 10 species from grasses weeds and 2 species from sedges have potential as forages (Table 1, 2,3). According to Lesman (2011), that is possible if it can to manage the supply of forage strategy both grasses and legumes. Weeds also compete with cultivated crops and other forages for moisture, light, and nutrients, but many weeds are nutrient-rich and digestible. The amount of weeds contained nutrition different in broad leaved, grasses and sedges. The qualities of weed nutrition to effects of individual weed species on hay quality, so that is worth exploring its effect on livestock.

Table 1. The kind of weed from broad leaved that have the potential as forages

No.	Kind of weed	Families	Place to grow	
			Aquatic	Terrestrial
1.	*Ageratum conyzoides* L.	Asteraceae/Compositae		*
2.	*Bidens pilosa* L. var. Minor (Bl.) Sherff	Asteraceae/Compositae		*
3.	*Emilia sonchifolia* (L.) DC.ex Wight	Asteraceae/Compositae		*
4.	*Galinsoga parviflora* Cav.	Asteraceae/Compositae		*
5.	*Alternanther philoxeroides* (Mart.) Griseb	Amaranthaceae		*
6.	*Erigeron sumatrensis* Retz	Asteraceae/Compositae		*
7.	*Euphorbia hirta* L.	Euphorbiaceae		*
8.	*Alternanthera sessilis* (L.) DC	Amaranthaceae		*
9.	*Amaranthus gracilis* Desf	Amaranthaceae		*
10.	*Amaranthus spinosus* L.	Amaranthaceae		*
11.	*Centella asiatica* (L.) Urb	Apiaceae/Umbeliiaferae		*
12.	*Heliotropium indicum* L.	Boraginaceae		*
13.	*Commelina benghalensis* L.	Commelinaceae	*	
14.	*Commelina diffusa* Burb.f.	Commelinaceae	*	
15.	*Cyanotis cristata* (L.) D.Don	Commelinaceae		*
16.	*Murdania spirata* (L.) Bruckner	Commelinaceae	*	*
17.	*Ipomoea triloba* L.	Convolvulaceae	*	*
18.	*Phyllanthus debilis* Klein ex Willd	Euphorbiaceae		*
19.	*Phyllanthus urinaria* L.	Euphorbiaceae		*
20.	*Physalis angulata* L.	Solanaceae		*

The result of research (Table 1, 2, 3) showed that there were 22 weed species identified. This amount was enough a lot and have significance, especially for traditional livestock grazing. According Salendu (2012), maintenance cattle extensively likely because there were still many available field of grass and other low quality forage.

Table 2. The kind of weed from grasses that have the potential as forages

No.	Kind of weed	Families	Place to grow	
			Aquatic	Terrestrial
1.	*Digitaria* sp	Poaceae/Gramineae		*
2.	*Eleocharis ochrostachys* Steud	Poaceae/Gramineae		*
3.	*Eleusine indica* (L.) Gaertn	Poaceae/Gramineae		*
4.	*Phragmites karka* (Retz) Trus	Poaceae/Gramineae		*
5.	*Sacciolepis indica* (L.) Chase	Poaceae/Gramineae		*
6.	*Isachne pulchella* Roth ex R.& B	Poaceae/Gramineae		*
7.	*Paspalum* sp	Poaceae/Gramineae		*
8.	*Panicum repens* L.	Poaceae/Gramineae		*
9.	*Panicum paludosum* Roxb	Poaceae/Gramineae		*
10.	*Oryza rufipogon* Griff	Poaceae/Gramineae		*

Table 3. The kind of weed from sedges that have the potential as forages

No.	Kind of weed	Families	Place to grow	
			Aquatic	Terrestrial
1.	*Cyperus kyllingia* Endl.	Cyperaceae		*
2.	*Cyperus rotundus* (L.)	Cyperaceae		*

CONCLUSION

The kind of weed consist of 20 species from broad leaved weeds, 10 species from grasses weeds and 2 species from sedges have potential as forages.

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The Effect of Liquid Extract Organic Fertilizer of Centrosema (*Centrosema pubescens*) Leaf Sheats on The Growth and Biomass Production of Elephant Grass (*Pennisetum purpureum*)

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ABSTRACT

This research was aimed to determine the effect of liquid extract organic fertilizer of centrosema (*Centrosema pubescens*) leaf sheets on the growth and biomass production of elephant grass (*Pennisetum purpureum*). This research used complete random sampling method with five treatments and three replications by using polybag as a planting media. The treatments conducted were P0 (0 ml liquid fertilizer/plant), P1 (10 ml liquid fertilizer/plant), P2 (20 ml liquid fertilizer/plant), P3 (30 ml liquid fertilizer/plant), P4 (40 ml liquid fertilizer/plant). The parameters observed were the growth of plant height, tiller number, fresh biomass production and leaf blade percentage of elephant grass. The results showed that the treatments were significantly affected on plant height, tiller number, fresh biomass production and leaf blade percentage of elephant grass. Each treatment obtained best results such as in plant height was reached at P3 (135 cm), tiller number and fresh biomass productions were reached at P4 (8,33 plants and 291,67 gr) and leaf blade percentage was reached at P1 (55,31%).

Key Words: Centrosema Leaf Sheath, Growth, Biomass Production, Elephant Grass

INTRODUCTION

Availability of forage fodder in cattle breeding business in particular is very important, because the feed forage is one of the basic necessities of life to improve livestock productivity. To meet the needs of the forage in the industrial-scale farms and households can be done in various ways, one of which is the development of forage fodder land. Efforts are made to the cultivation of certain types of grass pasture systems and non pasture on grazing or cut and carry in order to obtain optimum production.

There are many varieties of cut and carry grasses that are already utilized as beef cattle feeding. All that varieties generally have the character grow vertically, high productivity and has a lot of tillers and responsive to fertilization. Elephant grass is one that has been widely recognized by the public as a type of grass that has high productivity. This grass has been cultivated by farmers and livestock on an industrial scale. In order to increase the production of elephant grass, perform the various efforts that support the creation of conditions favorable environment for these plants. Steps are done through tillage and fertilization. Tillage is intended to prepare an optimal growing medium for plants. While fertilization aims to provide nutrients for plant growth as well as to replace nutrients lost or absorbed by plants (Mukhtar, 2005).

Fertilization elephant grass which has been frequently done is to use chemical fertilizer or organic or a combination of both. Fertilization with chemical fertilizers do have a significant effect for the growth of elephant grass. Chemical fertilizers have excellent ability in promoting plant growth and able to provide high yields. But over time, this method proved to have many shortcomings that are very detrimental to the life of living beings. Negative impacts biodiversity is declining soil causes the soil structure becomes dense and hard. In addition, the impact is even further is the use of chemical fertilizers is one of the largest contributors of greenhouse gas

emissions. Seeing this, the use of chemicals in the field of livestock industry gradually should begin to be abandoned and began to turn to organic fertilizers. Organic fertilizers are commonly used can be composted plant waste, composted manure and can also be combined with leguminous plants as green manure.

Utilization of legume crops as organic fertilizer has been developed mainly in the field of cultivation of green fodder. Plants of this type can improve soil fertility because it has the ability to fix nitrogen from the air and pass it into the ground. Various methods are used in fertilizer use legume crops, namely: 1) immersing a legume plant parts around the plant as compost; 2) extracting the leaves of legumes primarily to be used as a liquid fertilizer; and 3) Conduct a combination of grasses and legumes that nitrogen is absorbed by the roots of legume can be utilized by the grass plants.

One type of legume used as organic fertilizer is centrosema plants (Centrosema pubescens). The plant has the ability to absorb nitrogen very well so that the production of biomass is very high when combined with other plant species. In addition it also has the advantage centrosema can live in conditions of poor soil so that it can be used as ground cover plants known to have a good and rapid development. The nutrient content of centrosema leaves shown in Table 1.

Tabel 1. Nutrients Plant of Centrosema

Parameters	Materials content (%)
Dry matter	88,99
Crude protein	23,24
Crude fiber	8,80
Nitrogen	55,50
Calcium	1,22
Potassium	1,85
Phosphorus	0,54
Magnesium	0,30

Source: Nworgu, 2013

Centrosema plant's ability to absorb nitrogen from the air causing these plants contains a lot of nitrogenous especially on the leaves of plants, so it is good to be used as organic fertilizer. Liquid fertilizer production centrosema leaf extract has not been developed so that it would need to research how far centrosema leaf extract liquid material can be used as liquid fertilizer, especially in improving the productivity of forage fodder.

MATERIALS AND METHODS

Sample and Extract Preparation

The research was carried out at the experimental field of Animal Science Department of Agriculture Faculty, Gorontalo State University from November 2014 to February 2015. Liquid fertilizer used was extracted from the leaves of centrosema. The examined variety used was elephant grass (*Pennisetum purpureum*).

The method of making liquid fertilizer was as follows: Centrosema leaves as much as 100 grams of fresh chopped solvent was then extracted with water at a ratio of 1: 3. Extraction is done by using a homogenizer / blender for 15 minutes. The extraction is left for 24 hours then filtered using a soft cloth and then the solution is ready for use as a treatment.

Results of the analysis of nitrogen fertilizer Centrosema leaf extract can be seen in Table 2 as follows:

Table 2. Levels of Nitrogen (N) in Centrosema leaf extract

Sampel	Titration (ml)	N Each Titration
Filtrate	21,80	36,52%
Dregs	19,95	63,44%

Source: Chemical Laboratory, Mathematics and Science Faculty, Gorontalo State University

Experimental Design and Treatments

The research was conducted using a completely randomized design with 5 treatments and three replications that overall there are 15 experimental units. The study was conducted in polybag as a planting medium where every unit planted the grass cuttings. The liquid fertilizer treatments are as follows:

P0 : 0 ml per polybag
P1 : 10 ml per polybag
P2 : 20 ml per polybag
P3 : 30 ml per polybag
P4 : 40 ml per polybag

Treatment of liquid fertilizer performed two weeks after planting and repeated every two weeks until the 60-day-old plants. Each treatment is required fertilizer liquid fertilizer as much as 300 ml, whereas during the study conducted fertilization three (3) times, so the total fertilizers required for the study was about 900 ml.

Parameters and Measurements

Parameters and measurements performed at the age of 60 days after establishment. The parameters observed in this study are:

1. The growths of plant were plant height and tiller number. Plant height is measured from ground surface to the highest end of the plant. Tiller number is measured from any number of tillers that grow in complete (stems and leaves).
2. The production of biomass were fresh biomass and leaf blade percentage. Fresh biomass measured after defoliated from the soil surface. While the percentage of leaf blade measured based on the leaf blade weight divided fresh biomass.

Data Analysis

The data were analyzed statistically by the analysis of variance and the difference in the mean value was calculated by least significant different (LSD).

RESULT AND DISCUSSION

Elephant Grass Plant Growth

Plant height

Plant height is an indicator that the plant is able to absorb nutrients well and the availability of sufficient nutrients in the soil for plant growth. The growths of plant height between treatments are shown in Table 3.

Table 3 shown that the highest result obtained in P3 which was 135 cm, while the lowest growth at P0 was 107.67 cm. Analysis of variance in treatment centrosema leaf extract fertilizer on plant height elephant grass showed the treatment was significantly different (P>0.05). The data shown that fertilizer centrosema leaf extract at the level of the provision of 10, 20, 30 and 40 ml/plant showed higher growth than without fertilizer centrosema leaf extract. It shown that the fertilizer is given can provide nutrients that can be utilized for the growth of the plants.

Table 3. Mean of plant height of elephant grass 60 days after establishment

Treatments	Mean of Plant Height (cm)
PO	107,70[d]
P1	119,30[c]
P2	124,0[bc]
P3	135,00[a]
P4	128,70[b]

Note: P0, P1, P2, P3 and P4 were extract liquid fertilizer of 0 ml, 10 ml, 20 ml, 30 ml and 40 ml per polybag, respectively.
Different letter denote siqnificant difference among treatments at 5% level

Yani (2008), reported that complement organic liquid fertilizer showed significantly different effect on the growth of tall grass. Concluded the highest growth was obtained in the treatment of 4 ml/liter of water that is 65.24 cm, while liquid fertilizer without showing plant height 48.65 cm. This is because the grass needs nitrogen that is readily absorbed in the soil have not been fulfilled optimally as a result of the use of chemical fertilizers in the long term so that the use of the PLC has not shown the maximum results.

Treatment effect on plant height allegedly closely related to the dose/level of fertilizer applied, where the higher levels of fertilizer applied the more nutrients that plants can absorb. The average plant height data indicate that growth is only slightly lower P0 to P1, P2, P3 and P4. This is presumably due to the low nutrient that can be absorbed by plants that have not been sufficient to promote the growth of plant height maximum. As it is known that the leaf extract liquid fertilizer Sentro nitrogen content is high enough where these elements are very useful in the process of plant growth. This is in accordance with the opinion of Muhakka *et al* (2012) which states that the nitrogen needed by the plants in the process of the formation of proteins that boost the growth of crop plants such as stems, leaves and roots.

Lasamadi (2013) reported that states that the amount of the percentage of growth is highly dependent on the availability of nutrients in the soil, especially nitrogen and organic matter also directly affects plant physiology such as increased respiration to stimulate the uptake of nutrients that promote the growth and production of these.

Tiller Number

One indicator is the productivity of elephant grass seedling production/shoots, where a growing number of tillers, the more prospective parent in the future. Seedling production can be used to predict high and low weight of forage produced. The tiller number productions of elephant grass are shown in Table 4.

The data in Table 4 shown the production of elephant grass seedlings treated tends to be higher than the untreated. The highest production contained in P4 stem that is equal to 8.33, while the lowest production at P0 is 5.33 rods.

Results of analysis of variance showed that centrosema leaf extract fertilizer treatment effect was significantly different (P>0.05) on the production of elephant grass seedlings. Based on the data the average production of seedlings showed that production at P0 lower than treatment P1, P2, P3 and P4. This indicates that the leaf extract fertilizer Centrosema quite an effect on seedling growth of elephant grass, but due to the still low level of provision that is thought to cause the least nutrients that can be absorbed by plants so that there are no significant differences between treatments.

Lasamadi (2013) reported where the provision of effective microorganism fermented manure 4 (EM-4) Significantly affected the number of tillers grass where the composting of 30% indicates the average number of tillers as much as 29.8 stem, while without Compost fertilizer can only peak at 21.4 stems. This is According to Lasamadi (2013) Showed that the nutrient nitrogen

contained in organic fertilizers huge benefit for plant growth and development, Among others: making plant leaves more fresh greens and many Contain grains of green leaves (chlorophyll) the which has a very important role in the process of photosynthesis, plant growth Accelerate (height, number of tillers and branches) and increase of the protein content of the plant. The organic fertilizer to the soil conditions were critical or nutrient poor very good because of the addition of organic fertilizers in the soil, improving the structure of the soil is more crusts and increase of the number of pores of the soil so as to facilitate new shoots grow through the soil surface.

Tabel 4. Tiller number Production 60 days after establishment

Treatments	Tiller Number
PO	5,3
P1	6,3
P2	6,7
P3	7,0
P4	8,3

Note: P0, P1, P2, P3 and P4 were extract liquid fertilizer of 0 ml, 10 ml, 20 ml, 30 ml and 40 ml per polybag, respectively.
Different letter denote siqnificant difference among treatments at 5% level

Nuriyasa *et al* (2012) reported that organic fertilizer bio-urine as much as 75,000 liters/ha (150 ml/pot) significantly affect the production of elephant grass tillering fertilizer application biourin than without it. Fertilizer treatment of 150 ml/pot showed an average of seedling production growth of as much as 6.50 tiller while without fertilizer as much as 4.50 tillers. This shows that the amount of fertilizer given a great effect on the production of elephant grass tillers so it concluded that the level/doses given in this study was quite low which cause no significant differences after receiving treatment.

The second related study above shows that the higher the doses of fertilizer applied, elephant grass seedling production will be higher. It can be concluded that organic fertilizer can increase production elephant grass seedlings.

Biomass Production

Fresh Biomass

Fresh biomass production is the most important indicator in assessing the productivity of elephanth grass. A fresh production plant fresh weight after cutting, in this case the cuts are made at the plant with a distance of 10 cm from the ground. Cutting is done at the age of 60 days after planting. The mean of fresh biomass production was shown in Table 5.

Table 5 showed that fresh biomass production plant fertilizers centrosema leaf extract (P1, P2, P3 and P4) have a slightly higher fresh production of the plant without fertilizer (P0). Fresh average production is highest at P4 was 291.67 gr and the lowest production at P0 was 135 gr.

Tabel 5. Fresh biomass production 60 days after establishment

Treatments	Fresh Matter Weight (gr)
PO	135,0
P1	250,3
P2	258,0
P3	268,0
P4	291,7

Note: P0, P1, P2, P3 and P4 were extract liquid fertilizer of 0 ml, 10 ml, 20 ml, 30 ml and 40 ml per polybag, respectively.
Different letter denote significant difference among treatments at 5% level

Fresh biomass production shown that fertilizer centrosema leaf extract was significantly different (P>0.05). Results of previous studies on the use of liquid fertilizer on elephant grass plants show different things as reported Muhakka *et al* (2014), that the administration of liquid fertilizer with a dose of 2 l/ha showed the highest production among other treatments in which up to 648.93 gr/clump, this production is reported to be significantly different from the control treatment whose production only reached 306.95 gr/clump.

The absence of real effect Centrosema leaf extract fertilizer treatment in this study thought to be caused due to the still low level of fertilizer given to the treatment plant so that the nutrients are absorbed by plants is still low, thus the plants have not shown optimal growth. Nevertheless administration of liquid fertilizer Centrosema leaf extract proven to provide higher yields than without fertilizer. This shows Centrosema leaf extract fertilizer contains nutrients useful Baggi plants, especially nitrogen (N), which is needed in the growth and its produktivity.

Muhakka *et al* (2014) reported that nitrogen needed in the process of formation of plant proteins thus improving vegetative growth of plants such as stems, leaves and roots. Nitrogen is the main nutrient that can accelerate plant vegetative growth of plants (Nasaruddin, 2010). Nitrogen is needed to stimulate vegetative growth, increase the size of the leaves and increase the chlorophyll content. Kusuma (2013) reported that the fertilizer is an important source of nutrients for plants in the growth process both in increasing the vertical height, number of leaves, as well as the number of seedlings and crop production.

Leaf blade Percentage

A high percentage of leaves showed the quality of elephant grass plants, the higher the percentage of leaves showed that the higher the plant nutrients. This was due to more plant nutrients found in the leaves than the stems. The leaf blade percentage of this researched are shown in Table 6.

Tabel 6. Leaf blade percentage of elephant grass 60 days after establishment

Treatments	Leaf Blade Percentage
PO	54,5
P1	55,3
P2	54,2
P3	55,3
P4	55,1

Note: P0, P1, P2, P3 and P4 were extract liquid fertilizer of 0 ml, 10 ml, 20 ml, 30 ml and 40 ml per polybag, respectively.
Different letter denote significant difference among treatments at 5% level

Analysis of variance of the mean percentage of leaf blade showed Centrosema leaf extract fertilizer treatment was significantly different (P> 0.05) but almost similar from PO to P4. However it was high percentage reached at P1 and P3 than at P4 and lowest at PO and P2.

Previous research as reported Nuriyasa (2012), that the administration of liquid fertilizer on the plants bulrush bio-urine able to increase the number of leaves that fertilizer treatment as much as 75,000 ml/ha significantly different than without fertilizer biourin. Leaf extract liquid fertilizer treatment had no significant effect Centrosema allegedly caused by the low doses of fertilizers applied to the treatment that few nutrients that can be absorbed by plants. Nutrients contained in organic fertilizers are very beneficial to plants, especially in the formation of roots, leaves and stems of plants. According Nuriyasa (2012), the higher the dose of fertilizer biourin given to plant grass and Setaria the growth and forage production will increase. This is because the higher the nutrients available to plants cause growth and increased productivity.

Mulatsih (2003) reported that which conducts research on elephant grass discovered that the elephant grass didefoliasi at 30 days tended to show a higher percentage of leaves than didefoliasi between 45 and 60 days. Further stated that the longer the life of defoliation, the more chance the plants to grow and photosynthesize, so that the greater accumulation of carbohydrates and some carbohydrates that form is used for the formation of cell walls and further increase the proportion of stem and fresh forage grass. Opinion was supported by Kurniawati, in Mulatsih (2003), that at the age of short defoliation of plants are forming and growing new shoots so the plants need a lot of nutrients used plant organs such as leaves, so the ratio of leaf stems tend to be higher

CONCLUSION

1. The provision of liquid organic fertilizer Centrosema leaf extract significantly affected (P <0.05) on the growth of plant height and tiller number of elephant grass at the age of 60 days after establishment, the best results of plant height growth was obtained in treatment 4 (P3) was 135 cm, while tiller number in treatment 5 (P4) was 8.33.
2. The provision of liquid organic fertilizer Centrosema leaf extract significantly affected (P<0.05) and the percentage of leaf biomass production elephant grass, where the best treatment for fresh production is in treatment 5 (P4) which is 291.67 grams, while the percentage of leaf blade contained in treatment 2 (P1) is 55.31%.

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Improving The Quality of The Yoghurt With The Addition of Honey

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ABSTRACT

Yoghurt is one of the functional food products with the potential to be developed and needed by the community. This research aimed to improve the quality of the yoghurt with the addition of honey. The study employed Completely Randomized Design with four treatments: 2, 4, 6, 8, and 10% honey levels. The data were analyzed by anova followed by Duncan's Multiple Range Test if there were significantly effects. The results showed that the different honey levels gave significantly difference effect ($P<0.01$) on the crude protein content, but not significant ($P>0.05$) on PH. The highest adding (10%) of honey in yoghurt gave the best result with the crude protein of 4.34% and PH at 4.0. The sensory evaluation result showed significant differences ($P<0.05$) on texture and aroma, but not significant ($P>0.05$) on color and taste**.** Level of 10% of honey inclusion had the highest overall acceptability score.

Key Words: Yoghurt, Honey, Crude Protein, PH, Organoleptic Analyses

INTRODUCTION

Milk as food with high nutritional content is the optimum medium for the growth of microorganisms and is therefore susceptible to damage. One of the preservation technologies that have been used is through the fermentation process (Ebringer *et al.* 2008). Fermentation is a change in the basic materials into the desired product by utilizing a microorganism activity, with the hope of foodstuffs can be more durable, have palatability and digestibility is high. One of the original fermented dairy products has sufficient potential to be developed and be required by the public is yoghurt (Mohamed *et al*. 2014).

Yoghurt is made with starter inoculation using a mixture of *Lactobacillus bulgaricus* and *Streptococcus thermophilus.* Both types of lactic acid bacteria (LAB) work in synergy when fermenting milk (Lamoureux *et al*. 2002; Ramasubramanian *et al*. 2008). Improving the quality of yoghurt can be done with the addition of natural ingredients that works to increase the durability and value of the nutrients in yoghurt (Agarwal and Prasad, 2013). One alternative natural ingredient that is very effective in preventing damage and inhibits the growth of milk bacteria is honey.

Honey is a fluid-like syrup, viscous and sweet taste, produced by bees and insects other than nectar flowers. The sweet taste of honey is caused by the element *monosaccharide fructose* and *glucose* and has a sweet taste similar to sugar. Physical properties of honey are the type monoflora moisture content from 8.95 to 26.52%, the red color from 2.23 to 4.13, yellow 10.00 - 40.33, and a viscosity of 3.99 to 18.24 Poise. Chemical properties of honey monoflora is pH 3.87 to 4.48, total phenolic components from 371.4 to 1188.3 mg / 100 ml, maltose content of 6.71 to 28.82 mg / 100 ml, glucose 14.63 - 18.82 mg / 100 ml, and fructose from 28.82 to 41.30 mg / 100 ml (Chayati, 2008).

According to Taormina *et al*. (2001), honey can inhibit the growth of pathogenic bacteria such as *Escherichia coli*, *Salmonella typhimurium*, Listeria *monocytogenes*, *Bacillus cereus* and *Staphylococcus aureus*. This can be seen from the zone of inhibition produced by honey given to media who have planted these bacteria. In addition, honey can also inhibit damage boxed turkey meat that has been done by Antony *et al*. (2002). By adding honey in a certain concentration, pieces

of turkey meat containers have a shelf life longer than the pieces of turkey meat without adding honey containers.

The addition of honey to 10% in maize yoghurt provide the best quality improvement with the results of the analysis: 3.15% protein content, fat content 2.73%, 20.54% total solids, pH 3.8, 0.85% total lactic acid levels 0.32% ash, 4.49% fiber content, viscosity 4.66 dPa.s, total lactic acid bacteria 5.3 x 10^8 CFU / ml and total plate of 6.6 x 10^8 CFU/ml. Corn yoghurt products most preferred of organoleptic test results are corn yoghurt with honey addition of 8% with a score of 3.7 appearance, flavor 3.6, 3.9 consistency, color and aroma 3.7 3.6 (Nofrianti, Azima, and Eliyasmi, 2013).

MATERIALS AND METHODS

The study was conducted at the Laboratory of the Faculty Animal Husbandry, Kanjuruhan University, Malang. The materials used in the study were fresh cow's milk, honey, milk powder, and plain yoghurt as a starter. Starter cultures used consisted of *Streptococcus thermophillus* and *Lactobacillus bulgaricus.* The used honey was pure honey (products royal jelly).

Methods

The study was conducted using design completely randomized (CRD) with five treatments and 3 replications for each. The treatment were:

P0 = Yoghurt + honey 0%
P1 = Yoghurt + honey 2%
P2 = Yoghurt + honey 4%
P3 = Yoghurt + honey 6%
P4 = Yoghurt + honey 8%
P5 = Yoghurt + honey 10%

Measured Parameter

The variables measured were: pH, concentration of protein and organoleptic evaluation including color, texture, taste and flavor.

Research procedure

The making procedure of yoghurt in this study was describe as follow:

1. Milk pasteurisation.
2. After pasteurised, the milk was keep until the temperature decrease to 40^{o}C.
3. The addition of honey for each treatment (v/v). P0 was added 0% honey, P1 was added 2% of honey, P2 was added 4% of honey, P3, P4 and P5 was added 6, 8, and 10% of honey.
4. Innoculation of plain yoghurt starter in each treatment. The plain youghurt starter was added as much as 100 ml in each treatment.
5. The yoghurt was fermented during 24 hours at room temperature.
6. After fermentation, the yoghurts were evaluated their pH, protein concentration, color, texture, taste and flavour.

Data analysis

Data were analyzed using analysis of variance (ANOVA) for each treatment and organoleptic evaluation data were analyzed according to the instructions of Susiwi (2009). If there is a significant difference among the treatment, the analysis will be continued using Duncan Multiple Range Test.

RESULTS AND DISCUSSION

General characteristics Fresh Milk Cow

Data observation of fresh cow's milk in terms of physical and pH were shown in Table 1.

Table 1. Quality of Fresh Milk Materials Research

Parameter	Result
pH	6,7
Color	White
Flavor	Typical milk
Texture	Liquid
Taste	Normal

The average pH value of milk in this study by 6, 7 observations physically has a white color, typical flavor of milk, a liquid without lumps and having taste of normal milk. The pH value of 6.7 due to the milk is still in a fresh state and has not experienced contamination by microorganisms or other materials that can damage the quality of the milk. Requirement quality of fresh cow's milk has a pH of 6.3-6.8. However characteristic of color, aroma, flavor and consistency does not changes. Fresh milk pH ranging from 6.6 to 6.7, and if there is a fair amount of acidification by bacterial activity, these numbers will decrease significantly.

Yoghurt Product Quality

pH Yoghurt

Streptococus thermophillus in yoghurt served to break down into glucose lactose milk galactose (monosaccharide), while *Lactobacillus bulgaricus* metabolize the majority of monosaccharide into lactic acid. The average results of testing acidity yoghurt with honey and *plain* yoghurt as a starter at different level presented in Table 2.

Table 2. The average value of pH yoghurt

Level Honey	pH
P 0 (0%)	4.08
P1 (2%)	4.06
P 2 (4%)	4.06
P 3 (6%)	4.06
P 4 (8%)	4.00
P 5 (10%)	4.00

The average of each treatment showed that the usage level of the addition of honey gives no real effect on the pH of yoghurt (P> 0.05). The average pH for all treatments is 4.00. Based on research results, it can be seen that the addition of honey at various levels did not affect the pH. Sourness comes from *Lactobacillus bulgaricus* as lactic acid bacteria are able to convert lactose into lactic acid. Sour taste caused by pro donor to n, the intensity of sour taste pitch depends on H^+ ions are produced by acid hydrolysis of equal treatment for all. pH is the acidity of the actual value and the determination of the pH value is a better way than using acidity tertitrasi to determine the acidity of milk and dairy products. According to Hashim *et al.* (2009) pH yoghurt is determined by the type of milk used and the addition of stabilizers gelatin, alginate, and Ca has no impact on the change in pH and titration acidity of the yoghurt. Measurement of the degree of acidity (PH) is one

way to determine the characteristics and the quality of the newly formed yoghurt products. PH measurement in the food products in general are also used to determine the resilience of the food products against microbial contamination. Yoghurt is known as sour milk food products are classified in acidic medium with a pH of 4.0 to 4.5. Yoghurt product pH decrease during incubation occurs due to the accumulation of lactic acid produced by the activity BAL (Alakali, Okonkwo, and Iordye, 2008).

Levels of Protein Yoghurt

Results of analysis of variance showed that the addition of honey a different treatment of men wave difference protein content of yoghurt. The average value of the protein content of yoghurt served at Table 3.

Table 3. The average value of the protein content of yoghurt

Level Honey	Protein (%)
P0 (0%)	3.15[a]
P1 (2%)	3.37[a]
P2 (4%)	3.40[a]
P3 (6%)	3.67[b]
P4 (8%)	4.19[c]
P5 (10%)	4.34[c]

Description [a-c] Notation different in the same column shows the significant difference(P <0.01)

Based on data analysis, it can be seen that the addition of honey at various levels provide a very real effect (P <0.01) on the protein content of yoghurt. The average results of testing for protein content by adding honey highest level of 10% in treatment P5 was 4, 34%. This is due crude protein contained in yoghurt influenced by the initial content of the raw material is fresh milk with 2.8% crude protein. The higher the concentration of honey used the higher the protein content of yoghurt, it can be caused by component constituent substance interacts with components of honey yoghurt like a combination of *Lactobacillus bulgaricus* and *Streptococcus thermopiles* by fermentation of milk into yoghurt happen synthesis of vitamin B complex, especially thiamin (vitamin B1) as well as some of the amino acids making up the protein which is useful for health (Zhang, Liu, Su, Li, Sun, Liang and Jiaping, 2011)

Yoghurt Organoleptic Test

Organoleptic test of a food will affect the food accepted or rejected by consumers before assessing the nutrient content of foodstuffs. Organoleptic quality testing is done by using the sense of taste, smell and touches the consumed foodstuffs. Interaction with the research results of the sensory apparatus used to measure the quality of foodstuffs in the context of quality control and product development (Idris, 2004). Methods of testing the organoleptic quality of foodstuffs used to distinguish the quality of foodstuffs in taste, flavor and texture directly.

Color

Results of analysis of variance showed that the addition of honey treatment the difference was not significant (P> 0.05) against the favorite color of yoghurt. The average value of yoghurt color level is presented in Table 4.

On average liking the color of the lowest yoghurt in treatment without the addition of honey (0%). Assessment highest at 10% addition of honey treatment. Using some addition level of honey in the yoghurt manufacture did not give any effect on color preferences of yoghurt. This is due to honey comes from bees. Bees change sacharides is honey with chewing process several times until half-digested. This process is not done all at once. Once chewed, saccharides are still in liquid form and still contains of water, the next process is the evaporation as much as possible the water and the transformation of the enzyme. Together so that the colors are produced equally. Color yoghurt

derived from the milk is influenced by the pigment carotenoid. Natural carotenoid pigment plant as a precursor form of vitamin found in milk fat and gives a yellowish color.

Table 4. The average value of color preference level yoghurt

Level Honey	Color
P0 (0%)	2.70
P1 (2%)	2.62
P2 (4%)	2.75
P3 (6%)	2.75
P4 (8%)	2.87
P5 (10%)	3.25

Texture of Yoghurt

Results of analysis of variance showed that the addition of honey treatment very real difference to the texture of yoghurt (P <0.01). The average value of yoghurt served at Table 5.

Table 5. The average value of the level of preference texture of yoghurt

Level Honey	texture
P0 (0%)	2.70 [a]
P1 (2%)	2.75 [a]
P2 (4%)	2.64 [a]
P3 (6%)	2.70 [a]
P4 (8%)	3.46 [b]
P5 (10%)	3.62 [b]

Description [a-b]Notation different in the same column show a highly significant difference (P <0.01)

The average preference for the texture of yoghurt was lowest in treatment 0%. The Rate was highest at 10% treatment. Usage levels significantly affected the addition of honey a yoghurt texture. Yoghurt gel structure as compactness yoghurt which is the interaction of milk protein, casein and *whey* formed during the process fermentation. Density gel set by the balance calsium in dairy produce hydrophobic interactions between the proteins in milk (Ramasubrahmanian, Restuccia and Deeth, 2008). The addition content of total solid such as honey, skim milk, sodium caseinat, *whey protein concentrate* on low-fat yoghurt aims texture to prevent damage due to low gel formation and separation of *whey* on the surface of yoghurt. Texture is a very important characteristic that determines the quality (appearance, taste, and overall acceptance) in the manufacture of camel milk yoghurt containing antimicrobial agents (Hashim *et al.,* 2009).

Aroma of Yoghurt

Aroma or flavor is a factor *(hedonic test)* of panelists who are affected by compounds produced during fermentation. Results of analysis of variance showed that the addition of honey showed significant differences (P <0.05) to a yoghurt aroma. The average value of the level of preference aroma of yoghurt is presented in Table 6.

Preferences of panelists are real different of each treatment, but the high pitch panelists assessment contained in the addition of honey treatment 10%. Assessment was lowest for the treatment of 0%. According to Idris (2003), the aroma of yoghurt is not only influenced by the culture of the good and the ratio between *Streptococ us themophil us* and *Lactobacillus bu lgaricus* right. Both bacteria ratio should range between 1: 1 to 3: 2. The smell of the yoghurt comes from asetaldehi compound produced by *Lactobacillus bulgaricus* and *streptococcus thermophilus* from threonine.

Table 6. The average value of the level of preference aroma of yoghurt

Level Honey	Aroma
P0 (0%)	2.97 [a]
P1 (2%)	3.12 [a]
P2 (4%)	3.12 [a]
P3 (6%)	3.37 [b]
P4 (8%)	3.48 [b]
P5 (10%)	3.50 [b]

Description [a- b] Notation different in the same column show significant differences (P <0.05)

Yoghurt taste

Results of research on the taste of yoghurt with honey in different level presented in Table 7.

Table 7. The average value of level a yoghurt taste

Level Honey	taste
P0 (0%)	2.62
P1 (2%)	2.75
P2 (4%)	2.87
P3 (6%)	2.87
P4 (8%)	3:00
P5 (10%)	3:12

Preference for taste test was conducted by the tongue senses. Analysis of variance showed that the addition of honey treatment showed no significant difference (P <0.05) A race against a yoghurt. Assessment by the highest number of panelis are in treatment 10% of 3.1 2% and the lowest at 0% for 2.62. In general, an increase in the level of preference to the use of sequential addition of honey level. Content lactic acid gives a characteristic taste to the yoghurt. pH is an indication of the main determinants of the taste of the yoghurt in addition to the presence of volatile, sweet taste *(sweet flavor)* yoghurt will look at a pH between 4.6 to 5.0 but undetectable at a pH of 4.0 to 4.4. A distinctive flavor in yoghurt posed by the presence of lactic acid and small amounts of other compounds, among others *Acetaldehide,* diacetyl and acetic acid. Components produced by the symbiotic relationship mutualism between *S. Thermophillus* and *Lactobacillus* (Ott, Hugi, Baumgartner and Chaintreau, 2000).

CONCLUSION

The conclusion of this study is the effect of honey on various levels of the protein content and organoleptic quality that is based on the texture and aroma but there is no effect of adding honey at various levels on the pH (acidity) and organoleptic test based on color and the taste of yoghurt products. The level of honey at 10% gives protein content and preference level highes yoghurt products .

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Study of The Lipid Hydrolisis Ability of Some Lipolytic Bacteria Species in Preserved Meat Combination Method of Lettuce Leaf Ensiling and Kepayang Seed Fermentation

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ABSTRACT

Meat preservation with natural material use the combination method of lettuce leaf (*Lactuca sativa*) ensiling and kepayang seed (*Pangium edule Reinw*) fermentation is an easy, cheap, safely, and efficient preservation method that also could maintain the meat lipid contents. This preservation was done in order to prevent the meat from spoilage caused by bacteria. Preserved meat at the end of storage time could be spoilage caused of contaminant bacteria that can decrease the meat quality. This research was done to: (1) analyze the lipid hydrolysis ability of some lipolytic bacteria in preserved meat in a qualitative and quantitative manner; (2) analyze the decrease of the lipid content in preserved meat that were stored during 0, 7, 14, and 21 days. The lipid hydrolysis ability of six bacteria species isolated from preserved meat were analyzed in qualitative manner by inoculate on Nutrient Agar added with meat oil and incubated in 37^0C during 1x24 hour. The lipid hydrolysis ability of lipolytic bacteria species were analyzed in quantitative manner by analyze the lipid content on preserved meat that were stored during 0, 7, 14, and 21 days use the nutrient broth medium added with the meat oil. The research result shows that: (1) the six bacteria species isolated from preserved meat were lipolytic bacteria; (2) *Citrobacter freundii* have the highest lipolytic hydrolysis ability and *Klebsiella rhinoscleromatis* have the lowest lipolytic hydrolysis ability; (3) the lowest decrease of the lipid content is on the preserved meat that storage in 21 days.

Key Words: Lettuce Leaf Ensiling Fermentation, Kepayang Seed Fermentation, Lipid Hydrolysis, Lipolytic Bacteria

INTRODUCTION

Meat is often suffered losses as a result of damage. Improper handling of meat causes the texture of the meat to be rapidly changing and decaying. Biological damage which is the physiological is damage the meat, which is caused by metabolic reactions in the meat case with the help of enzymes. The process of damage caused by chemical processes with the help of enzymes found naturally in meat causing autolysis process occurs (Muchtadi, 2010). Biological damage caused deterioration of meat quality. Microbiological damage, namely damage caused by bacterial activity occurring contaminants in meat pH 6.4 to 6.6 (Muchtadi, 2010). The meat has a pH range between 6,4 to 6,6. It is appropriate for the growth of spoilage bacteria contaminants that can grow optimally at a pH range of 6,5-7,5 (Apriyanti, 2010) that can cause spoilage of meat.

Meat also contains nutrients needed by the bacteria so that the flesh can be damaged as a result of bacterial activity. Siregar (2008) argued that most of the meat spoilage bacteria of protein and lipid. This is caused by high water levels, i.e. 70-80% of the weight of the meat causing spoilage bacteria are easy to grow and multiply, because according to the optimum moisture content for bacteria between 56-80%. The characteristics of the meat that is damaged and becomes rotten, causing a decrease in the quality of meat, meat color is pale brown to bluish, soft texture of meat and meat when dipped in water will float on the water surface (Sudiarto, 2010).

Some species that live in the flesh that has been preserved there that are lipolytic, means capable of hydrolyzing lipids. Lipid is one of the groups including a group of lipid compounds. Lipid as

an energy source and biological has the meaning as a store of reserve substances. Lipid is stored in certain tissues in the lipid tissue in the meat (Kaplan, 1976). Suhirman (2011) suggested that there is a section containing meat and lipid can bind oxygen from the air. Oxidation on the fiber result in damage called rancidity. Outside influence on the process of decaying meat mainly caused by bacteria that have lipolytic enzyme lipase that can break down lipid, causing a decrease in the levels of lipid in meat (Suhirman, 2011).

Based on the description above can be understood that the preservative is needed to prevent meat spoilage microorganism activity, so that the quality is maintained as desired. Preservatives are needed in the handling of meat, but we must still consider safety. There is a preservation method using a natural preservative, which is biologically by using lettuce and kepayang seed. Preservation methods with a mix of ensiling fermentation lettuce and kepayang seed can maintain shelf life of meat is preserved for a longer period of time, with better quality and still favored by consumers, as well as safe for health.

Meat preserved by ensiling fermentation method lettuce blend and fermented kepayang seed can still be damaged in a certain length of time of storage caused by bacterial activity lipolytic. There will likely be differences in the ability of hydrolysis between bacterial species lipolytic thus necessary to test the ability of hydrolysis of each species of bacteria isolated from meat lipolytic preserved meat with lettuce blend ensiling fermentation and fermented kepayang seed. The purpose of this study was to: (1) to analyze differences in the ability of lipolytic hydrolysis of some species of bacteria that comes from meat that has been preserved by ensiling fermentation blend of lettuce and kepayang seed qualitatively and quantitatively; (2) analyzing the decrease in the lipid content of meat preserved with a variety of shelf life.

MATERIALS AND METHODS

Materials

The tools used in this study include: (1) tool for the purposes of sterilization: autoclave; (2) tools for the manufacture of medium: gas stove, analytical balance digital Sartorius, a measuring cup Pyrex ukuran10 ml, 100 ml and 500 ml Erlenmeyer flasks Pyrex size of 500 ml, 1000 ml, glass cup Pyrex measure 2000 ml test tube, test tube rack, glass stirrer, *micropipette,* (3) means for testing for protein content by spectrophotometer, and (4) tools for inoculation and incubation: Petri dishes, inoculation needle straight edge, light spritus, *laminar air flow,* incubator, vortex Sibata brands.

The materials used in this study, include: samples of beef, medium NAL (Nutrient order + oil meat), medium slant Nutrient Agar (NA) aluminum foil, wrapping paper, paper labels, rope mattresses, plastic, blotting paper, cotton , lighters, tissue.

Method

After getting the bacteria that resulted from the inoculation of bacteria from meat on medium slant NA, then the determination of bacterial isolates that are lipolytic. Determination of proteolytic bacteria that are qualitatively done by scraping inoculums of each bacteria in the test medium, namely: Nutrients For oil + and cultures were incubated at 37 ^{0} C for 1x24 hours. Bacterial colonies growing on the surface of the medium is observed. If the red color is formed on the basis of the medium, meaning the bacteria is able to hydrolyze lipid or is lipolytic.

Testing the ability of bacterial species lipolytic hydrolysis quantitatively by means of measurement of lipid content in meat preserved by means of spectrophotometry carried out with the following steps: (1) is taken 5 g of meat and diluted to 100 ml with distilled water in the flask; (2) of the above solution, taken 5 ml and 10 ml was added *amido Black* in a 15 ml centrifuge tube and shaken. Allowed to stand for 10 minutes and then centrifuged at a speed of 2,500 rpm for 5 minutes. 3 ml of the supernatant was taken and diluted to 200 ml in a flask and read the *Optical Density* (OD) with a *Spectronic* 20 spectrophotometer at a wavelength of 615 nm; (3) made blank by replacing 5 ml sample with 5 ml of distilled water. Standardize the spectrophotometer to zero OD

with distilled water and reading the OD blank (with the cuvette). Price corrected OD (OD - OD blank) is used to determine the lipid content by reading the standard curve.

Determination of the characterization and identification of bacterial isolates each lipolytic characterized by colony morphology, microscopic observation, and physiology, then be identified to the species level. Some characters isolates are described to determine the bacterial species is: (1) carried out a description or characterization of the morphology of the bacterial colonies that includes colony color, form colonies, the edge of the colony, elevation colonies, the diameter of the colony, the nature of the colony gloomy / shiny, and growth form colonies on the medium oblique; (2) cytological characterization of bacteria that include the nature Gram, cell shape, cell size, the ability to form spores, presence or absence of the capsule, the motion abilities of bacteria, and the type of respiration; (3) the characterization of the properties of bacterial physiology using a media device identification of *Microbac* ^{TM} *GNB 12A / B / E, 24E Identification Kits* that include reaction test lysine decarboxylase, ornithine decarboxylase, H_2S production, fermentation of glucose, mannitol, xylose, β- galactosidase (ONPG), indole production, the type of respiration, hydrolysis urease, reaction Voges-Proskauer (VP), the use of citrate, tryptophan deaminase (TDA), melting gelatin, inhibition malonate, fermentation inositol, sorbitol, rhamnosa, sucrose, lactose, arabinose, adonitol, raffinose, salicin, and dihidroksilase arginine.

RESULTS AND DISCUSSION

Testing the quality of the meat with the pickling treatment ensiling fermentation lettuce and beans kepayang long storage time 0 days, 7 days, 14 days and 21 days based on the test results of the lipid content. Data preservation observations with variations influence the shelf life of the lipid content in meat presented in Table 1 as follows:

Table 1. The lipid content of meat preserved with variation Future Store

Long storage time (Today)	Meat Lipid Content (%) in			Σ (%)	Mean (%)
	Deuteronomy 1	Deuteronomy 2	Deuteronomy 3		
Control	3.617	3,619	3,619	10.855	3.618
0	3.639	3.539	3,589	10.767	3,589
7	3.032	3,033	3.032	9,097	3.032
14	2,697	2.797	2,647	8.141	2,714
21	1,788	1.838	2,037	5.663	1,888

Table 1 show that the levels of lipid in the control, i.e. untreated meat preservation, i.e. 3.618%. In the provision of preservation treatment with long storage time 0 and 7 days resulted in lower lipid content than the controls. Lipid levels continue to decline until the long storage time of 14 days resulted in lower lipid content, which is 2.714%. Based on the results of calculation of the lipid content, meat preservation treatment with long storage time 0 days, 7, and 14 days is still suitable for consumption under the provisions of the minimum limit of the lipid content of meat from FAO (1972), amounting to 2.300%.

In the treatment of meat preservation with long storage time of 21 days resulted in the lowest lipid content, i.e. 1.888%. Meat on a long storage time of 21 days not suitable for consumption and undergo rancidity. Meat is preserved on a long storage time of 21 days no longer fit for consumption, because the lipid content is less than the minimum limit the lipid content of meat from FAO (1972), amounting to 2.300%.

Testing the physiology of the nature of lipolytic against six species of bacteria found in meat with lipid hydrolysis was aimed to test the ability of each species of bacteria qualitatively. Lipolytic properties of the bacteria proved by the red color of colonies of bacteria on the bottom of the order plus lipid Nutrient medium (NAL). Based on the description of morphological features, microscopic,

and physiology as well as identification, it is known that the meat is preserved discovered 6 species of bacteria, namely *Klebsiella rhinoscleromatis, Proteus vulgaris, Klebsiella ozaenae, Enterobacter agglomerans, Bacillus subtilis, Citrobacter freundii.* Data from testing the physiology of lipolytic and proteolytic properties qualitatively to 6 species of bacteria found in meat presented in Table 2 below.

Table 2. Determination of lipolytic properties from six species of bacteria that came from meat that has preserved

Bacteria Species	**Hydrolysis ability lipids (lipolytic)**
Klebsiella rhinoscleromatis	**+**
Proteus vulgaris	**+**
Klebsiella ozaenae	**+**
Enterobacter agglomerans	**+**
Bacillus subtilis	**+**
Citrobacter freundii	**+**

Remarks: + = has the ability hydrolysis

Based on Table 1 it proved to be the species of bacteria that possess lipolytic by the red color of the colonies of bacteria on the basis of medium NAL is *Klebsiella rhinoscleromatis, Proteus vulgaris, Klebsiella ozaenae, Enterobacter agglomerans, Bacillus subtilis, Citrobacter freundii.* This proves that the species is capable of hydrolyzing in the medium NAL lipid into lipidity acids and glycerol thus lowering the pH of the medium NAL indicated with the red color indicator.

Figure 1. Ability Test Results Hydrolysis of Lipids Qualitative Against Bacteria by Using Nutrient Medium For added lipid (NAL)

Description:

= The red color of the bacterial colonies on the basis of medium NAL showing that bacteria are lipolytic, ie capable of hydrolyzing lipids

The determination of the ability of lipid hydrolysis quantitatively was to test the ability of the lipid hydrolysis of each species of bacteria in liquid nutrient medium plus lipid (NCL). Determination of the ability of the lipid hydrolysis with NCL, NCL marked by a color change after incubation for 1x24 hours, the red color changes to yellow. The NCL test results are presented in Figure 2.

Description: The bacteria inoculated on medium NaCl before incubated 1x24 hours, visible red color as an indicator of lipid is not hydrolyzed by bacteria

Description: Bacteria inoculated in NaCl medium after incubated 1x24 hours, appears yellow as an indicator of lipid has been hydrolyzed by bacteria

Figure 2. Test Results The hydrolysis of lipids Qualitative Capabilities Against Bacteria Using Liquid Nutrient Medium plus lipid (NAL)

The results of ability of hydrolysis test quantitatively were presented in Table 3.

Table 3. Testing Results Hydrolysis of Lipids Quantitative Ability

Code	Species name	Replay	m.gls	m samples	m.end	Lipid Content (%)
NCL		1	36 579	2,006	36 632	2,780
		2	39 612	2,016	39 666	2,679
		3	36 529	2,002	36 582	2,647
NCL A	Klebsiella rhinoscleromatis	1	39 435	2,018	39 567	2,669
		2	36 586	2,008	36 637	2,540
		3	39 613	2,014	39 666	2,632
NCL B	Proteus vulgaris	1	36 025	2,005	36 020	2,345
		2	32 052	2,012	32 093	2,038
		3	32 143	2,018	32 198	2254
NCL C	Klebsiella ozaenae	1	36 596	2,006	36 647	2,543
		2	36 032	2,007	36 080	2,392
		3	32 164	2,016	32 124	2298
NCL D	Enterobacter agglomerans	1	32 054	2,012	32 090	2,029
		2	36 034	2,016	36 078	1,877
		3	36 047	2,009	36 089	1,986
NCL E	Bacillus subtilis	1	35 986	2,012	35 896	2108
		2	35 869	2,010	35 784	2,104
		3	36 048	2,008	36 086	1,987
NCL F	Citrobacter freundii	1	36 529	2,647	36 582	2,002
		2	36 023	2,013	36 060	1,838
		3	36 036	2,012	36 078	1,854

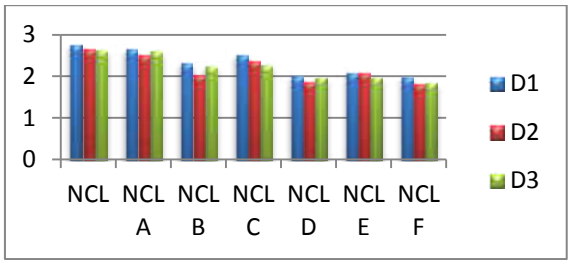


Figure 3. Testing Capabilities by hydrolysis of lipids Quantitative Each species of bacteria inoculated in NCL at 37^0C for 1x24 hours

Based on Table 3 and Figure 3 can be proved that each species of meat spoilage bacteria in the body has the lipids hydrolisis ability are different. The highest lipid hydrolysis ability shown by the ability to reduce the lipid content of the highest compared with NCL as a control. At NCL medium not inoculated meat spoilage bacteria. Bacterial species with the highest lipid hydrolysis capability is *Citrobacter freundii* whereas bacterial species with the lowest lipid hydrolysis capabilities demonstrated by its ability to reduce the lipid content is at least *Klebsiella rhinoscleromatis.*

Data analysis results of the treatment effect ensiling fermentation pickling with a mix of lettuce and kepayang seed with variations of the shelf life of the meat quality is reviewed based on the nutrient content includes the lipid content can be seen in Table 4 below:

Table 4. Effect of Variety Fingerprint Analysis with Variation Period Preservation Store to Include Content Test Nutritional Fat Content in Meat

	JK	**db**	**KT**	**F**	**Sig. 0.05**
Between groups	6134	4	1,533	298 495	.000
In Group	.051	10	.005		
Total	6,185	14			

F_{count} preservation factors to the variation in the shelf life of the significant level of 5% greater than the F_{table} is: 298.495 ≥ 3.36, so the hypothesis is accepted, which means no treatment effect on the quality of meat preservation reviewed based on fat content.

Based on the results of this research have proven that the preservation of the variety of factors shelf life significant effect on a significant level of 5% of the fat content in meat is preserved so it needs to be continued with Duncan test 5%.

To determine the pickling treatment with long storage time can be tested Duncan 5%. The result can be seen in Table 5. Based on Table 5 summarizes the Duncan test 5% and Figure 5 is proven that there are four variations influence the shelf life tested in the meat is preserved for preservation treatment with ALT bacterial colonies indicated by a pickling treatment with the notation. In Table 4 it can be seen that the highest content contained on the amount of time for 0 days, followed by 7 days, and 14 days with 3,589 (notation a), 3.032, and 2.714 (notation b and c), then the amount of time during 21-day low of 1,888 (notation d). This means that the amount of time for 0 days better than the longer the storage time for 7 days, long storage time for 7 days is better than the longer the storage time for 14 days, and the duration of storage for 14 days better than the longer the storage time for 21 day.

Table 5. Summary of Test Results Duncan 5% Effect of Long Time Storage for Meat Fat Content Test Results

Long storage time (Today)	The mean (%)	Notation difference
Control	3.618	a
0	3,589	a
7	3.032	b
14	2,714	c
21	1,888	d

Description: The value notation accompanied by different letters in the same column means different significantly

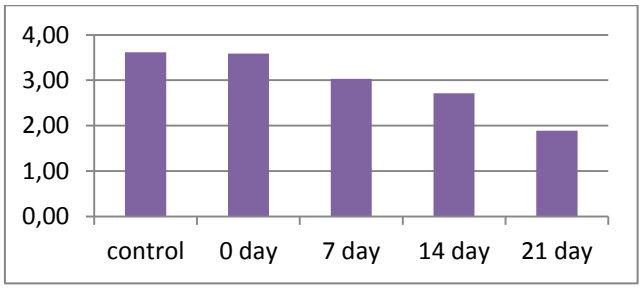


Figure 5. Effect of Treatment Preserving the Future Store variation of the Fat Content of Meat

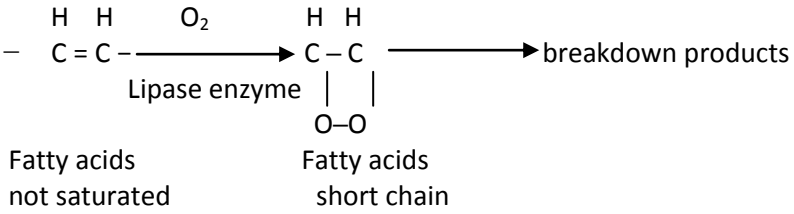
Results of this study demonstrate that long storage time for 0 days, 7 days and 14 days produces a higher fat content compared to the length of time of storage for 21 days. Long storage time for 21 days apparently show the lowest fat content. This proves that the longer the meat preserved and stored will decrease fat content.

Meat preserved by ensiling fermentation fusion method lettuce and bean fermentation kepayang store has a time limit because of the ability of the compounds antibacterial preservative in meat decreased inhibition. At a time limit of 21 days store rapidly growing bacterial contaminants and can hydrolyze fat in the meat so that the body fat levels decreased. The results showed that six species of spoilage bacteria in meat body has lipolytic properties. These six species of bacteria are *Klebsiella rhinoscleromatis, Proteus vulgaris, Klebsiella ozaenae, Enterobacter agglomerans, Bacillus subtilis, Citrobacter freundii.* This is in accordance with the opinion of Holt (2000) suggest that the species *Proteus vulgaris* has a lipase enzyme that acts as biokatalisator in the decomposition of fat to acid fat and glycerol. *Proteus vulgaris* species are pathogenic in humans and various animal intestines, and can also be found living in the manure from animal manure, soil and polluted water (Kenneth, 2009; Breed, 1957).

Based Juven (1981) and Aguskrisno (2011), *Klebsiella* species *ozaenae* have lipase. Indonesian center of Biodiversity and Biotechnology (2003), Qian (2009), and Rodarte (2011) suggested that the species of *Enterobacter agglomerans* also be lipolytic; species of *Enterobacter agglomerans* also has a lipase enzyme. Furthermore Fogarty (1983), and (Norris, 1971) also states that the species *Bacillus* that can produce esterase and lipase is *Bacillus subtilis, Bacillus coagulans and Bacillus cereus.* Juven (1981) and Wallen (2007) suggested that *Citrobacter freundii* have lipolytic properties. *Ferundii Citrobacter* species have lipase.

Lipolytic bacteria are capable of degrading fats into fatty acids and glycerol. This is in accordance with Desroiser (1988) suggested that the enzyme lipase and oxygen from the air around the meat body can break down fatty acids unsaturated double bonds into short-chain fatty acids.

Breakdown of unsaturated fatty acids can be seen in the following figure.



Short-chain fatty acids are formed causes rancidity in the flesh. Rancidity is causing changes in aroma and taste of the flesh. The smell turn into bad meat and sour taste rancid meat while turning into bad, rancid sour, and bitter.

Results of the analysis of the ability of the hydrolysis of some species of bacteria lipolytic in meat is preserved with the method blend of fermented ensiling lettuce and fermented bean kepayang shows that bacterial species *Citrobacter freundii* is a species of bacteria that has the ability hydrolysis highest fat as indicated by its ability to reduce fat levels highest in comparison with the NCL as control. *Rhinoscleromatis Klebsiella* bacterial species has the lowest fat hydrolysis ability shown by its ability to lower the fat content of at least.

The existence of the species lipolytic bacteria in meat which is preserved and stored proved that meat preservation have saved time limit. If the storage time limit has been exceeded, the meat cannot be consumed because besides not suitable for consumption by microbiological quality and nutrient content decreases, aroma and taste are also changing. There is the possibility of spoilage bacteria produce toxins that can contaminate. Fatty acids and glycerol produced by lipolytic bacteria in addition to lowering the quality of meat can also cause health problems and the species of bacteria that are lipolytic spoilage of meat can also be pathogenic.

CONCLUSIONS AND SUGGESTIONS

Conclusion The research results can be expressed as follows: (1) six bacterial species found in this study, is *rhinoscleromatis Klebsiella, Proteus vulgaris, ozaenae Klebsiella, Enterobacter agglomerans, Bacillus subtilis, Citrobacter freundii* has lipolytic properties. (2) based on the quantitative test results showed that six species of bacteria have the ability lipolytic fat hydrolysis different. bacterial species have the highest fat hydrolysis capability is *Citrobacter freundii* and species of bacteria that have the ability lowest fat hydrolysis is *Klebsiella rhinoscleromatis;* (3) the fat content in meat curing declined during the storage time of 0, 7, 14 and 21 days; (4) a decrease in the lowest fat content in meat preserved stored in a storage time of 21 days.

Suggestions results of the study can be expressed as follows: (1) research can be continued by using a variety of species other meats commonly consumed by the public, so that the preservation techniques can be applied more widely by using various species of flesh scattered in Indonesian waters are usually consumed community; (2) Storage of meat preserved with a blend method ensiling fermentation kepayang lettuce and seeds should be no more than 14 days in order to remain fit for consumption.

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Dairy Cattle Business Development Through Agribusiness System Supporting Business District of Karangploso Ngijo in The Village of Malang Regency

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ABSTRACT

Milk as one of protein source from animal besides beef has large contributes for the nutrition fulfillment. The potential of dairy cows in Indonesia is enormous. The Ngijo village in Karangploso District of Malang Regency is one of the centers of dairy cattle. Dairy farmers are in partnership with the cooperative to distribute the production. Most farmers in the Ngijo village in Karangploso District of Malang became a member of KUD Karangploso. The aim of this study was to determine the role of co-operatives as the agribusiness system supporting business in the development of dairy farm in the Ngijo village. As sample are 50 farmers belonging to cooperatives in the Ngijo village. Direct observation and interviews method conducted to retrieve data directly. The results showed that the cooperative has a very important role for the business development of the dairy farmers in the Ngijo village. But this has not been supported by the institutional capacity of cooperatives in improving the welfare of members of the cooperative in this respect is the dairy farmers. Breeders still require training and counseling as a provision to increase the business in terms of both quality and quantity.

Key Words: Business Development, Dairy Cattle, System Agribusiness, Cooperative

INTRODUCTION

Development in the field of livestock lately has begun in full swing. Livestock sub-sector is expected to continue to increase its role in the fulfillment of basic human needs, especially related to the nutritional needs of the animal, as a food-producing animal protein of high nutritional value in addition to improving the quality of human resources (HR), expand employment opportunities and improve the income of livestock farmers. Development of livestock sub-sector is crucial to meet the public demand for livestock. Rising incomes, increasing population and awareness of nutrition, causing demand for livestock products is increasing.

Livestock-based agribusiness development region is one alternative to the breakthrough program that is expected to address the challenges and demands of livestock development is to improve the income and welfare of the community.

Dairy cattle is one of the commodity -producing animal protein than meat, East Java has a large population of dairy cows when compared to most other regions in the island of Java. In East Java alone is not all regions have dairy cows. The largest concentrations of dairy cows are in Malang, Pasuruan, Blitar and Tulungagung. Dairy farm in Malang can be found in the area Karangploso, Pujon, Batu, and Kepanjen. Dairy farming system that is still a kind of farm people who only small scale and still refers to the maintenance of conventional systems. Many of the problems are arising either from the agribusiness system upstream to supporting agribusiness system.

Currently dairy farmers are in the shade of the cooperative. For farmers, the cooperative is an organization of organizations that can help farmers in their business activities. Most farmers in the village Ngijo Karangploso District of Malang became a member of KUD Karangploso. Hopes to join the cooperative, the farmers can easily access information about the latest in of the farm so that our farmers can develop their business. But the journey, cooperatives have many obstacles and

problems in developing the dairy cattle business. It's required mutually beneficial cooperation among dairy farmers, dairy cooperatives and dairy processing industry in order to progress (Farid, 2011).

The aim of this study was to determine the role of co-operatives as the agribusiness system supporting business in the development of dairy farm in the village Ngijo Karangploso District of Malang.

MATERIALS AND METHODS

The research was conducted on dairy farmers belonging to cooperatives in the village Karangploso Ngijo Karangploso District of Malang. The research method is a survey. Data obtained through documentation and interviews with breeders using questionnaires. Structured questionnaire was used to collect information. The questionnaire consisted of closed and open questions. Secondary data is data that is collected indirectly from other sources such as books, newspapers or from institutions.

Parameter Observed

In this study, the observed parameter is the role of co-operatives as the agribusiness system supporting business in the development of dairy farm in the village Ngijo Karangploso District of Malang.

Sampling Method

Sampling using simple random sampling technique, every member of the population has an opportunity and an equal chance to be selected as the sample. Samples 50 people taken are dairy farmers who are taking cash payments milk.

Data analysis

Data were analyzed descriptively as indicated by Setyosari (2010) that descriptive research is research that aims to explain or describe a situation , event , object whether people, or anything related to the variable - variable can be explained both by numbers and words.

RESULTS AND DISCUSSION

Characteristics of Respondents

Based on Gender

Respondents were 84% male and 16 % women. With it can be concluded that the respondent male more than female respondents by a margin of 34 (68 %).

Based on Age

The respondent's age can be seen in Table 1. At the age of 41-50 is the age in work. The higher the person's age, it is less dependence on other people or more independent.

Chamdi (2003) suggests, the young age of farmers (age 20-45 years) general curiosity towards something higher and interest to adopt towards higher technology introduction. Soekartawi (2002), states that farmers who are elderly usually fanatical about tradition and it is difficult to give understanding - understanding that can change the way of thinking, way of working and way of life. This farmer is apathy toward new technology.

Table 1. Percentage of respondents' age

Age Group (Years)	Percentage
≤ 20	4
21-30	26
31-40	26
41-50	32
51	≥ 12

Based on Education

The education of respondents can be seen in Table 2.

Table 2. Education levels among the respondents

Education Level	Type Of Education
Low education level	SD- SMP / MTs
Secondary education	School
Higher education level	S1

Overview of respondents by education level are grouped into three levels namely low education level (SD- SMP / MTs) , secondary education (high school) and higher education level (S1) . Respondents with the highest percentage are low education levels as much as 92 %.

With low levels of education possessed cause a person to lack the specific skills required by someone. Limitations of skills or education of a person will lead to limitations in the ability to enter the world of work (Ahmadi, 2003)

Based Livelihood (main job)

Based on the results of the questionnaire, 100% of the respondent's main job is the breeder. They do not have other side jobs. It is also supported by the low education level of farmers which 92 % are graduates of elementary / junior high school education are considered low.

Based The Number Of Dependents In The Family

Based on the results of the questionnaire, obtained the number of respondents to the classification bit as much as 54 % and the classification was as much as 46%. By having fewer family responsibilities, expectations will increase welfare.

The more family members who live together, the more the cost of living that must be removed. On the other hand the family members are an asset for farmers in the form of labor that can be utilized in managing the farm. Thus more and more members of my family members were owned by farmers the more workers can be exploited (Wahab , 1998)

Based on Total Ownership Livestock

Based on the results of the questionnaire, 46 % of respondents have less than 5 females productive. This makes the results of its production is still very small so that the influence of family income. Ownership of livestock is the number of dairy cattle owned by farmers of dairy farmers at

the time of data collection research. A large number of dairy cattle owned by the business scale also show the ownership of dairy cattle.

Based on Revenue per month

Based on the results of the questionnaire, it appears that the percentage of the highest classification of the income of farmers in the intermediate classification as much as 28%, 26% lower classification, the classification is very low as much as 20%, very high classification as much as 16 % and 10% higher classification. Most respondents are in a position intermediate classification, which means the income of the farmer members of KUD Karangploso.

Based on Raising Experience

The numbers of respondents who have the longest experience of rising are 32 %, i.e. for more than 15 years. This is because farmers do not have another job besides as a breeder and supported also by the level of education possessed only limited elementary / junior high school.

The duration of the breed does not guarantee could increase the income of farmers, because farmers tend to use the same knowledge and skills in maintenance their cattle. The longer the experience gained raising more and more, so that the better management. But the experience has not been able to raise governance improve maintenance so that the productivity of farmers still.

Training for Farmer

Based on the results of the questionnaire, 44% of farmers have never attended training provided by KUD. 30 % had been trained as < 2 times, 12 % had been training as much as 3-4 times, 14 % had been trained as > 5 times. There are still many farmers who have not attended training organized by KUD. Training is actually a means for farmers to increase the ability of individual farmers.

Luyombya, 2014 in his research on the training of farmers stated that training is necessary for the farmer. The training of farmers provided include how milking, hygiene in the milking process , selecting and breeding , feed management , and animal health

Extension for Breeders

Based on the results of the questionnaire as many as 38 % of farmers are following the extension granted by KUD as < 2 times. 28 % of farmers had never participated in the extension. They assume counseling activity is an activity that is not so important for the progress of the cattle business. Melisa, 2013 in the research stated that there is a presumption and a positive influence does the extension seen from the increase after the extension so that the success rate of extension in the implementation of the five cattle business.

Benefits for Farmers Cooperative

Based on the results of the questionnaire, as many as 38 % of farmers are felt benefit cooperative in facilitating the purchase of livestock needs. With the cooperative would accept the results of the production of milk farmers, it can assist in the marketing of products breeder.

Is an agribusiness cooperative system in which a series of supporting agribusiness in developing animal husbandry. The function of the cooperative is to meet the needs of members to promote the welfare, establishing the resources of members and the community develops potential and economic capacity of the members, develop aspirations of member economies and societies in the cooperative activities, opportunities to its members to actualize themselves in the economic field optimally. The role of cooperatives in the marketing of dairy cattle is very large people. Diwyanto et al . (2007) stated that most marketing fresh milk from farmers (> 90 %) is coordinated by Cooperative / GKSI.

CONCLUSIONS AND SUGGESTIONS

Conclusions

Cooperatives have a very important role for the business development of the dairy farmers in the village Ngijo Karangploso District of Malang. But this has not been supported by the institutional capacity of cooperatives in improving the welfare of members of the cooperative in this respect is the dairy farmers.

Suggestions

Cooperatives need to promote training and extension activities for dairy farmers in order to increase their knowledge so that they can develop their farm business in terms of both quality and quantity.

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Mapping of Leading Livestock Subsector in East Java Province

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ABSTRACT

Livestock subsector contributes substantially to the economy of East Java Province. This study was conducted to identify and mapping the leading livestock subsector in 38 districts/cities in East Java province based on data GDRB in 2009-2013. The analytical method used is Location Quotient (LQ), Shift-Share (SS), and Klassen typology. LQ analysis results indicate that the livestock subsector is a bases sector (LQ>1) in 26 districts/cities and the non base (LQ<1) in 12 districts/cities. SS analysis showed that the growth of the livestock subsector is progressive (SS>0) in 7 districts/cities, while in 31 districts/cities is slow (SS<0). Based on analysis Klassen typology this research concluded that the livestock subsector is the leading sector (LQ>1 and SS>0) in 7 districts/cities, namely Bojonegoro, Madiun, Mojokerto, Pacitan, Pasuruan, Trenggalek, and Tuban.

Key Words: Livestock Subsector, Location Quotient, Shift-Share, Klassen Tipology

INTRODUCTION

Recent development of livestock is based on the vision to create competitive and sustainable livestock by optimizing local resource to improve the supply and security of animal food and also the welfare of farmers (Ditjen PKH, 2011). Three key words stay around this vision: competitive livestock, local resource optimization, and farmer welfare. Competitive livestock means that the output of livestock has a leading capacity either in competitive or comparative advantage. Local resource optimization means that the resource shall be derived from many regions in Indonesia, including its genetic resource (livestock, food, master seed, and vaccine prime), and livestock technology based on agro-ecosystem and socio-economic conditions of Indonesia. Farmer welfare means those farmers are able to fulfill the economic necessities of their household.

East Java Province is the production center of various livestock commodities in Indonesia, such as meat, milk and egg. Beef, milk, and egg in East Java Province contribute orderly for 22%, 53%, and 23% to the production of beef, milk and egg in Indonesia (BPS, 2015). Great contribution of livestock commodities from East Java Province to national production is indicating that livestock subsector have quite strong contribution to local economic, either for food source, workforce absorbance, industrial raw material, or local income to the community and region. Given great contribution of livestock subsector to national production and local economic, it can be said that these subsector is very potential to become the leading sector in economic development of East Java Province.

This research attempts to identify and to develop the mapping of the leading livestock subsector in 38 regencies/towns of East Java Province based on GDRP data in period 2009-2013. Result of research may then be useful as the consideration base in formulating the policy of livestock development in East Java Province or all Regencies/Towns in East Java Province.

MATERIAL AND METHOD

Material

Research area is determined purposively (Sugiyono, 2009), resulting in 38 Regencies/Towns in East Java Province. The background of area selection is that East Java Province is the production center for various livestock commodities such as meat, milk, and egg. Secondary data are used and the type is time-series data of Gross Domestic Regional Product (GDRP) from 38 Regencies/Towns in East Java Province on period 2009-2013. Data source is obtained from BPS of East Java Province.

Method

Location Quotient (LQ)

Location Quotient analysis is conducted to identify base and non-base sectors in a region. This technique attempts to compare the capacity of a region to produce a commodity with another region which produces similar commodity (Heijman and Schipper, 2010). In this research, LQ is formulated as follows:

LQ = [vi/vt] / [Vi/Vt]

where :

vi = GDRP rate from livestock subsectors in various regencies/towns

vt = GDRP total of various regencies/towns

Vi = GDRP rate from animal husbandry subsectors in province

Vt = GDRP total of province.

LQ>1 means that livestock subsectors are classified as the base sector in a region. The production of subsectors can fulfill the demand of a region and possibly be exported to outside. LQ < 1 signifies that livestock subsectors are not the base sector. The production of livestock commodities in a region cannot fulfill self-demand and thus, it always relies on external supply or import. LQ = 1 means that there is self-sufficiency among livestock subsectors in a region. The production is only sufficient to fulfill the demand of the region but without capacity for export (Budiharsono, 2001).

Shift Share (SS)

Shift Share analysis is performed to identify sources or components of regional growth. The result of analysis helps the reader to understand the development of a certain sector in a region to ensure whether this sector is slow or fast performer if relatively compared with other sectors. SS analysis differentiates regional production change into three components, respectively *national growth component* (abbreviated as PN), *proportional growth component* (abbreviated as PP), and *regional share growth* (abbreviated as PPW) (Budiharsono, 2001). Three components of growth are explained as follows:

$\Delta Yij = PDRB2 - PDRB1 = PNij + PPij + PPWij$

$\Delta Yij = PNij + PBij$

$PBij = PPij + PPWij$

where:

ΔYij = regional economic growth

PDRB1 = PDRB on the early year of calculation

PDRB2 = PDRB on the late year of calculation

PNij = regional growth effect

PPij = proportional shift

PPWij = differential shift

PBij = net growth

PPij>0 means that livestock subsectors in a certain region has experienced fast growth, whereas PPij<0 signifies for slow. PPWij>0 means that livestock subsectors in a region has competing

ability, while PPWij < 0 signifies for the lacking of competing ability. PBij>0 means that the growth of livestock subsectors in a region is progressive, whereas PBij<0 relates with laggardness.

Klassen Typology

Klassen Typology is used to obtain the description of the pattern and structure of sector-based growth in a region. This analysis involves assigning the sector into proper group based on its growth and contribution to PDRB of a region (Widodo, 2006). According to Klassen Typology, a certain sector can be assigned to 4 categories such as: (1) *Prime Sector (Leading)* with LQ>1 and SS>0; (2) *Potential Sector* with LQ>1 and SS<0; (3) *Developing Sector* with LQ<1 and SS>0; and (4) *Undeveloped Sector* with LQ<1 and SS<0 (Adhitama, 2012).

RESULT AND DISCUSSION

Base Sector and Non-Base Sector

Result of Location Quotient analysis shows that livestock subsector is considered as the base sector (LQ>1) in 26 Regencies/Towns and is classified into non-base sector (LQ<1) in 12 Regencies/Towns (Table 1). The average rate of LQ for East Java Province is 1.62. This LQ rate means that livestock subsector is the base sector in East Java Province. The production of livestock commodities in East Java Province not only satisfies the regional demand of East Java population but also has been potentially for trade with outside or has export capacity. Livestock commodities that are tradable to another region are beef, broiler meet, egg, and milk.

Subsector Growth

Result of Shift Share analysis shows that net growth of livestock subsector that is considered as progressive (SS>0) is only found in 7 regencies/towns, whereas in 31 regencies/towns the growth is slow (SS<0). Net growth average of livestock subsector in East Java Province is 15.10 (Table 1). Negative sign means that during period 2009-2013, livestock subsector have experienced slow growth in most regencies/towns in East Java Province. Slow growth of livestock subsector is related to the fact that the number of animals provided for slaughtering and trade to other region is greater than those born and trade into East Java Province.

Leading Subsector

Based on the analytical results of Location Quotient, Shift Share, and Klassen Typology, it is found that livestock subsector considered as the Leading Sector (Prime Sector) are found in 7 regencies, such as Bojonegoro, Madiun, Mojokerto, Pacitan, Pasuruan, Trenggalek, and Tuban (Table 2). In these regencies, livestock subsector have a greater contribution to GDRP than livestock contribution in provincial level (LQ>1). These livestock subsector have faster growth than that in provincial level (SS>0). Some livestock subsector classified as Potential Sector are evident in 19 regencies, such as Bangkalan, Banyuwangi, Blitar, Bondowoso, Jember, Jombang, Kediri, Blitar City, Lumajang, Magetan, Malang, Nganjuk, Ngawi, Pamekasan, Ponorogo, Probolinggo, Situbondo, Sumenep, and Tulungagung. All these regencies have their livestock subsector with greater contribution than that in provincial level (LQ>1), but the growth is slower than provincial level (SS<0). Some livestock subsector considered as Undeveloped Sector are observed in 12 regencies/towns such as Gresik, Batu City, Kediri City, Madiun City, Malang City, Mojokerto City, Pasuruan City, Probolinggo City, Surabaya City, Lamongan, Sampang and Sidoarjo. The undeveloped sectors are marked by the contribution and growth in regency/town level that are lower than those in provincial level (LQ<1 and SS<0).

Table 1. Location quotient, shift share, and klassen typology analysis of livestock subsector in east java

No	Regencies/Towns	Location Quotient		Shift Share		Klassen Typology
1	Bangkalan	1,43	Base	-41,74	Slow	Potential Sector
2	Banyuwangi	1,60	Base	-22,08	Slow	Potential Sector
3	Blitar	7,23	Base	-21,83	Slow	Potential Sector
4	**Bojonegoro**	**1,41**	**Base**	**17,95**	**Progressive**	**Leading Sector**
5	Bondowoso	2,95	Base	-16,14	Slow	Potential Sector
6	Gresik	0,49	Non Base	-12,51	Slow	Undeveloped Sector
7	Jember	2,68	Base	-16,25	Slow	Potential Sector
8	Jombang	1,85	Base	-8,46	Slow	Potential Sector
9	Kediri	2,61	Base	-3,56	Slow	Potential Sector
10	Kota Batu	0,90	Non Base	-18,75	Slow	Undeveloped Sector
11	Kota Blitar	1,21	Base	-33,68	Slow	Potential Sector
12	Kota Kediri	0,02	Non Base	-26,23	Slow	Undeveloped Sector
13	Kota Madiun	0,09	Non Base	-58,53	Slow	Undeveloped Sector
14	Kota Malang	0,03	Non Base	-16,84	Slow	Undeveloped Sector
15	Kota Mojokerto	0,05	Non Base	-60,37	Slow	Undeveloped Sector
16	Kota Pasuruan	0,71	Non Base	-31,87	Slow	Undeveloped Sector
17	Kota Probolinggo	0,43	Non Base	-51,94	Slow	Undeveloped Sector
18	Kota Surabaya	0,00	Non Base	-35,57	Slow	Undeveloped Sector
19	Lamongan	0,59	Non Base	-8,88	Slow	Undeveloped Sector
20	Lumajang	3,06	Base	-21,12	Slow	Potential Sector
21	**Madiun**	**1,89**	**Base**	**9,91**	**Progressive**	**Leading Sector**
22	Magetan	2,09	Base	-3,04	Slow	Potential Sector
23	Malang	1,82	Base	-7,24	Slow	Potential Sector
24	**Mojokerto**	**2,16**	**Base**	**10,90**	**Progressive**	**Leading Sector**
25	Nganjuk	2,98	Base	-29,68	Slow	Potential Sector
26	Ngawi	1,27	Base	-6,09	Slow	Potential Sector
27	**Pacitan**	**2,68**	**Base**	**43,36**	**Progressive**	**Leading Sector**
28	Pamekasan	3,63	Base	-10,74	Slow	Potential Sector
29	**Pasuruan**	**1,34**	**Base**	**10,72**	**Progressive**	**Leading Sector**
30	Ponorogo	1,52	Base	-0,06	Slow	Potential Sector
31	Probolinggo	1,52	Base	-8,05	Slow	Potential Sector
32	Sampang	0,84	Non Base	-33,79	Slow	Undeveloped Sector
33	Sidoarjo	0,14	Non Base	-23,64	Slow	Undeveloped Sector
34	Situbondo	1,10	Base	-2,25	Slow	Potential Sector
35	Sumenep	1,45	Base	-39,53	Slow	Potential Sector
36	**Trenggalek**	**2,64**	**Base**	**4,54**	**Progressive**	**Leading Sector**
37	**Tuban**	**1,43**	**Base**	**0,05**	**Progressive**	**Leading Sector**
38	Tulungagung	1,65	Base	-0,64	Slow	Potential Sector
	Jawa Timur	**1,62**	**Base**	**-15,10**	Slow	**Potential Sector**

Table 2. Klassen typology of livestock subsector in east java

Klassen Typology		Sectoral Growth	
		SS>0 (Progressive Growth)	**SS<0 (Slow Growth)**
Sectoral Contribution	**LQ>1 (Base Sector)**	**Leading Sector:** Bojonegoro, Madiun, Mojokerto, Pacitan, Pasuruan, Trenggalek, and Tuban	**Potential Sector:** Bangkalan, Banyuwangi, Blitar, Bondowoso, Jember, Jombang, Kediri, Kota Blitar, Lumajang, Magetan, Malang, Nganjuk, Ngawi, Pamekasan, Ponorogo, Probolinggo, Situbondo, Sumenep, andTulungagung
	LQ<1 (Non Base Sector)	**Developing Sector:**	**Undeveloped Sector:** Gresik, Kota Batu, Kota Kediri, Kota Madiun, Kota Malang, Kota Mojokerto, Kota Pasuruan, Kota Probolinggo, Kota Surabaya, Lamongan, Sampang, and Sidoarjo

CONCLUSION

According to Klassen Typology, it is concluded that livestock subsector is the Leading Sector (LQ>1 and SS>0) in 7 regencies, respectively Bojonegoro, Madiun, Mojokerto, Pacitan, Pasuruan, Trenggalek, and Tuban.

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Building Animals Cattle Collective Farming Systems As An Alternative In Anticipation Of Impact Global Warming (Case In Taruna Tani Cocoa Farmers In East Kolaka)

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ABSTRACT

This study titled build cattle farming systems collectively as an alternative to mitigate the effects of global warming (the case of the cadets peasant farmers in East Kolaka), conducted in June - the month of September 2015, by choosing two districts, namely, District Lambandia and District Lalolae, East Kolaka Regency, Southeast Sulawesi Province, Indonesia.

The location determination is done by purposive, while sampling done by accidental (convenience sampling) as many as 80 young cadets peasants in each district that's selected. Data were analyzed using qualitative descriptive.

Research results show that the impact of global warming affect or result of a very broad and affects the lives of cocoa farmers in East Kolaka. This forced farmers to find alternatives to continue to generate revenue one is the development of beef cattle in groups plan administered by the cadets peasants.

Taruna farmer has a potential which is very encouraging when viewed from age, education and experience in farming. However, separately skills to manage the business of cattle still require intensive counseling. Meanwhile, regarding the opinion / feedback regarding the diversification of farm cattle with cocoa, they generally agree, with the exception of the use of capital still need support from the government. It is recommended to government still gives good relief of beef cattle farming technology and capital support.

Keywords: Diversification, Cattle, Cocoa, Cadets Young Farmer, Heating Global.

INTRODUCTION

The influence of improved incomes and welfare caused changing consumption patterns. One of the changes in consumption patterns are shifting demand for animal protein supplied from livestock meat, including beef. The fulfillment of such meat comes from local cattle and beef imports. The last few years the price of beef cattle climbed more than 100 percent. Previously only Rp. 45,000 / kg, up to Rp. 130,000. The high prices triggered by the imbalance between demand and supply. To replace the old government must import about 53 139 tons from Australia, an increase of approximately 35 percent.

To achieve food security in 2017, it needs to think about how to build centers capable of sustainable farm people. Breeders expected are breeders who have entrepreneurial skills, so that their business can actually be managed professionally. Potential candidates breeders that can be built are where family cocoa farmers generally have family members (children) aged teens but have the will pioneer patterned farm livestock business collective.

The consideration is, in addition to pioneering the cattle business, are also expected to give each other mutual advantage between cocoa farming with cattle farming (mutualism symbiosis) which have their parents wrestled.

Mutual benefit relationship in question is the waste product that has not been optimally economic value, it can be a valuable product for the farming between the two. In addition, the most

important is the presence of cocoa trees can create a suitable environment for the cattle to adapt due to the impact of global warming (climate change).

The purpose of this research is to study about the possibility of establishment of the cattle collective effort among the young cadets cocoa farmer, integrated with cocoa plants that had been managed sustainably in East Kolaka. Hope is to be achieved, can be useful for consideration by the government in involving young people participate in the realization of food self-sufficiency by 2017. At the same time become an additional job opportunities.

RESEARCH METHODOLOGY

This research is located in East Kolaka Regency, Southeast Sulawesi Province, Indonesia which took place in June - September 2015, by choosing two districts, namely, District and Sub-district Lambandia and Lalolae. Both districts are selected on the basis that both are centers of progression of cocoa plants and has a population of adolescent age category (cadets farmer). The location determination is done purposively.

The samples were done by accidental (convenience sampling) as many as 80 young cadets farmer in each s for the family the cocoa farmers in the area. Districts are popularly elected. Primary data were collected by interviewing the selected respondents using questionnaires that had been prepared in advance. While secondary data was obtained by collecting information from relevant agencies, both verbally and in writing of annual reports. The collected data were analyzed descriptively qualitative.

RESULTS AND DISCUSSION

The Potency of Beef Cattle on Cacao Plantations in The Southeast Sulawesi.

Southeast Sulawesi province has a huge potential to develop the cattle business. It is strongly supported by the availability of natural resources (land shepherd, natural food and agro-climate) is highly suitable as a condition of cultivation.

Large current livestock population in the form of cows and bulls totaled 902 144 tails. This indicates that there are still many lands untapped including cocoa plantation area which covers 196 884 ha by the number of cocoa farmers reached 103 297 people in 2007. The main problem facing the cocoa in Southeast Sulawesi is the declining productivity of the cocoa crop in the last 5 years who live productivity of 0.633 tons / ha.

Cocoa drastic decrease in productivity caused by plants that are no longer productive (plant age over 25 years) and the number of plant pests and diseases that attack cocoa crops. This greatly affects the interest of farmers to develop further from the plant. Whereas demands for cocoa beans are still very high in the world market, major in Europe. One seeks to recover such interest is to choose the cattle business as a business integration cattle-cocoa involving cadets farmer groups that exist in this region.

If this potential can be realized, 50%, then the number of livestock that can be accommodated is 29 million units of livestock. If the averaged results per cow of 150 kg means being able to produce 4350.000 tons, while national needs only 600,000 tons / year. Means when in Southeast Sulawesi can be maximized cattle business, and then Indonesia no longer needs to import cattle.

Global warming effect or result of a very broad and affect both human life on Earth, plants and animals. One of the things experienced by farmers in East Kolaka is the emergence of various pests and diseases in plants cultivated cocoa. As a result, the productivity of cocoa declined drastic, advanced farmer revenue slumped.

Resources are considered very potential in this area is the presence of young farmer cadets who took the initiative to form groups of cattle farmers, if there is government assistance for forging, moreover, the circle of biotic, abiotic, and farmers of cocoa in the region. Some examples

have been performed by cocoa farmers in Polewali Mandar difersificate cocoa-farming with the pattern of Beef Cattle.

Excess of cattle is their ability to adapt to the environment. Some of the nature of cattle that can be tailored to their global warming is the ability to regulate body temperature by changing behavior, such as reducing the activity during the day, shelter in the shade of trees to stabilize body temperature in the face of high temperatures or resting in a cage, using rocky places to withstand strong winds.

The nature of beef cattle are mentioned above, can be met in an environment of cocoa farming in Kolaka East, namely by way of herding under cacao trees during the day and stabled at night in a cage that has been made / prepared by groups of farmers.

Human Resource Potencial

East Kolaka District is one district in Southeast Sulawesi province, Indonesia. East Kolaka a result of expansion of Kolaka adopted at the plenary session of the Parliament on December 14, 2012 in the Parliament building on the Draft Law on the New Autonomous Region (DOB)

Subdivisions of East Kolaka District is divided into 13 districts, namely: Ladongi, Lalolae, Lambandia, Loea, Mowewe, Poli Polia, Tinondo, Tirawuta, Uluiwoi, Dangia, Aere, Ueesi and Iwoimendaa. The population inhabited these region as much as 123.507 inhabitants. A total of 15.24 per cent as the age group between 15-24 years are classified as cadets.

Based on this research, it was found that the younger age groups who belong to the farmer Taruna very encouraging or potential. In addition to young age, they also have high levels of which are classified as good educators that have average finish at the high school level and has had a relatively long experience of farming. To detail can be seen in Table 1.

Table 1. Distribution of respondents by age, education and farming experience, in East Kolaka, Sulawesi Tenggara, Indonesia, in 2015.

Number	item	Age (years)	Education Level	Farming Experience
1	Highs	24	College	4
2	Lows	16	High school	9
3	Average	19	High school	7

Taruna farm located in East Kolaka Kabupten highly of potential to be developed into a cattle farmer actors that are integrated with the cocoa farming. Taruna farmer are already expert on cocoa cultivation. Only when directed to cattle, it is expected that cross-department cooperation between agencies plantation and livestock services. Training on cattle farming is needed, so that the cadets have the skills of farmers in the cultivation of cattle and so become a professional breeder.

Cocoa Farming as A Business Partner

There are seven provinces, namely national Cocoa development areas of Southeast Sulawesi, Aceh, West Sumatra, Central Sulawesi, South Sulawesi, West Sulawesi and East Nusa Tenggara. Cocoa development areas nationwide in seven provinces, based on Agricultural Ministry Decree No. 46 / Kpts-PD.300 / 1/2015 deployed in 18 districts and most is Southeast Sulawesi, the five districts. The fifth district was Konawe, South Konawe, Kolaka Kolaka Kolaka North and East.

Southeast Sulawesi's cocoa crops were grown by farmers in almost all districts/cities. Other districts are expected to continue to provide support for the district and the potential can be proposed as the national cocoa development department. Currently, the government is finishing Southeast road map / master plan development of the cocoa region. The road map will be used as the basis for any development of the area district to develop a plan of action.

In Southeast Sulawesi, cocoa is the main plantation commodities and plays an important role in the regional economy, in terms of providing employment for 159 174 head of the family farm. In addition 66% of smallholder tree crop production in Southeast Sulawesi cocoa comes from. In the Year 2012, recorded a total area of 246 508 ha of cocoa plantations, production of 146 705 tons with a productivity of 810.8 kg / ha.

There are various problems that up to now there are at farming cocoa people in Southeast Sulawesi, namely: (1) the age of the plants that are old, (2) the attack borer cocoa (PBB), black pod disease and VSD, (3) low productivity (4) quality of cocoa produced is still arbitrary and (5) non-functioning farmer institutions.

These issues result low production of cocoa which is obtained by farmers, so that the income of farmers is declining. Various programs continue to be implemented to support the improvement and increased production of cocoa, including cocoa-based program implementation MP3MI conducted since 2013. The event was held in the district of East Kolaka, Southeast Sulawesi.

Opportunities emergence of centers of development of beef cattle are patterned collectively be better. The success achieved will give a positive effect to other young people in order to have its own source of income. As a result of government efforts to tackle unrest in cattle and cocoa sufficient community can be realized. All cadets peasants had ever attended formal education with an average have completed secondary education level. It's a potential, because in business operations can easily follow the training given by trainers, let alone supported by the experience of farming that is quite an average of 7.5 years.

The Response to The Cadets Farm Animal Breeding Cattle

Given the potential of human resources, in this case the peasant youth, it gives a sense of optimism to advance a wide range of farming in rural areas, particularly integrating cocoa farming as the main commodities supported by farming cattle. The second farm is suitable to be integrated because it has the nature of a mutually beneficial (symbiotic mutualism). Affluent of cocoa shells in the form of cocoa pods and leaves pruned from the cocoa plant can be fermented to be used as cattle feed. Instead, artists cow dung feces and urine can be used as manure for the cocoa plant fertility.

Regarding the opinion or feedback cadets farmer as respondents basically welcomes the plan where the cattle business, given that some 62% chose not to continue their studies to college level. They chose to help the elderly to maintain their cocoa plants along with other businesses that can generate money. To see how much the distribution of respondents to opinion / feedback regarding the cattle breeding, can be seen in Table 2.

Table 2. Responses of cadets farmer to plan where the business cattle in East Kolaka, 2015

Number	Response option	Opinion	
		Agree (%)	Disagree (%)
1	Agree you become cattle ranchers?	83.75	16.25
2	Agree the cattle business done collectively?	80.00	20.00
3	Agree raising livestock are integrated with your?	77.50	22.50
4	Agree when Venture capital is borne by you?	43.75	56.25

Based on Table 2, turns feedback/opinion regarding the willingness to become a cadet peasant farmers are very welcome, it is seen, as much as 83.75% (76 respondents) chose the answer agrees. This is supported by optimism that the breeding can increase household income, other than

income derived from cocoa products. Moreover, during this time they look at the fact the decline in cocoa farming products in the region. While choosing not agrees, they reasoned that do not have the skills / abilities in maintaining cattle.

Options 2 and 3 are generally those giving a positive response as well by answering agree, namely the 2nd option as much as 80.00 percent (64 respondents) and the 3rd option as much as 77.50 percent (62 respondents).

Option 2 all said in their opinion / response based on the ownership of capital and labor. They are limited in the ability to capitalize their business alone, because they are relatively not having sufficient savings to buy cows or calves. Similarly, in the care of his cattle in the future, cannot do alone because the other businesses that must be handled. For those who disagree, their parents generally considered able to capitalize cow cattle business in the future despite the limited amount. They assumed anyway, if the venture on their own, can more freely manage it.

Option to-3 that raising livestock in an integrated way, as much as 77.50 percent (62 respondents). Those who choose to agree assume that, if done in an integrated manner in addition to providing additional income, also can effectify free time during this quiet time is wasted on work activities in the cocoa fields they have. While those whom choosing not agrees assume that they do not have enough time to take care of everything.

In all four options, namely the imposition of capital had borne alone. More respondents disagreed that is 56.25 percent (65 respondents) on the grounds that they need support assistance from the government as an additional initial capital. While agreeing only 43.75 percent (35 respondents) for reasons not want to be burdened by debt or rules that can be a burden in the future in managing their business.

CONCLUSION

Based on these results, it can be concluded that, diversification cattle can be an alternative to cocoa farmers and their families to maintain the viability of cocoa farming in decline.

Taruna farmer as spearhead the development of beef cattle with a collective system can be realized given the potential of the peasant warriors when viewed in terms of age; education; farming experience and a strong motivation to manage it. This is supported also by the condition of natural resources and the support of humans.

There is need for extensive support from the government in the aspects of beef cattle farming technology and capital.

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Variation on Body Weight and Body Dimension of Buffalo in Kabaena Island, Bombana, Southeast Sulawesi

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VARIATION ON BODY WEIGHT AND BODY DIMENSION OF BUFFALO IN KABAENA ISLAND-BOMBANA, SOUTH EAST SULAWESI

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ABSTRACT

Kabaena island is one of the region in Bombana district, Southeast Sulawesi Province that has high population of buffalo, especially swamp buffalo. Buffaloes were kept by certain farmer or group of people from one generation to next generation. However, there were no available information relate to body weight and body dimension of this buffaloes. The objective of this research was to measure the body weight and body dimension of the buffalo and the data could be used as a basic data for developing the management of buffalo breeding and production in this area. The research was conducted in Central Kabaena and East Kabaena from July to August 2013. The buffalo were grouped on the basis of age (1-2 years and > 2 years old) and gender (male and female). The total number of buffaloes measured were 86 buffaloes. Variables measured consisted of body weight, head length, head height, shoulder height, hip height, hip wide, girth, and body length. Data were analyzed and presented in average and standard deviation, and coefficient of variation. The results showed that body dimensions of male young buffaloes (1-2 years old) were higher than female young buffaloes. However in adult buffalo (>2 years old), body dimension of female buffaloes tended to be higher than the male buffaloes. However in adult buffalo (>2 years old), body dimension of female buffaloes tended to be higher than the male buffaloes. While on the basis of coefficient of variation, it was revealed that coefficient of variation of body dimension of buffaloes in Kabaena island was still high (>10%) compared to the standard one (<10%), except for shoulder height and hip height.

Keywords: buffalo, coefficient of variation, body weight, body dimension, Kabaena

INTRODUCTION

Southeast Sulawesi province has considerable potential for buffalo production, because it has not only unplanted wide humid area but also the wide range of rice field (estimated 152394 ha, Southeast Sulawesi BPS, 2012) which use buffalo power in its production system. However, this potential was not correlate to the buffalo population number which was only 5.294 heads in 2010 (BPS Sultra, 2011), even during the period of 2005-2010 it decreased 9.95% per year. This is the serious threaten for the population of buffalo in Southeast Sulawesi.

Bombana district is one of the distribution area of buffalo in Southeast Sulawesi. The population of buffalo in this area was about 907 buffaloes or 36.40% of total population of buffalo in Southeast Sulawesi (BPS, 2012). Population of buffalo in this area was distributed both in mainland (Poleang) and island (Kabaena). The island has specific characteristics and relatively isolated, so it was expected could affect the the genetic quality of livestock production, including buffalo. However, the data related to production traits such as life weight and body dimensions of buffaloes were unknown. Therefore, research has been carried out with aim to analyze the variation of life weight and body dimensions of buffalo in Kabaena island, Bombana, Southeast Sulawesi.

MATERIAL AND METHOD

The research was conducted in Kabaena island covering Central Kabaena and East Kabaena from July-August 2013. Digital balance, measuring stick and measuring tape were used to measure the variables noted. The buffaloes were group on the basis of age and gender (1-2 yo: 23 heads 12 buffalo bulls and 11 buffalo cows; >2 yo: 63 heads 18 buffalo bulls and 45 buffalo cows).Variables measured were live weight, head length, head height, shoulder height, hip height, hip wide, shoulder wide, girth and body length. Data were analyzed and presented as a mean, standard deviation, coefficient of variation and explanade scriptively.

RESULTS

Table 1. Live weight and body dimension of buffalo aged 1-2 years old in Kabaena Island, Bobana District, Southeast Sulawesi

Table 2. Live weight and body dimension of buffalo aged >2 years old in Kabaena Island, Bobana District, Southeast Sulawesi

DISCUSSIONS

The results showed that the average of live weight of buffalo cows were higher than buffalo bulls both at age of 1-2 years (Table 1) and at age >2 years (Table 2). At age of 1-2 years the average weight of buffalo bull only 279.88±52.65 while buffalo cows reached 391.20±150.03kg. At age of >2 years the average weight for buffalo bull was 427.70±70.0 kg, while buffalo cow reached 499.08±87.71. Life weight of buffalo bull in both age categories were still quite diverse, especially in category of age 1-2 years with a coefficient of variance (CV) 29.55% for buffalo bulls and 38.35% for buffalo cows. The average of body weight of buffaloes in this study were relatively different from statements of Shanmuan and Chantalakhana (2002) that average buffaloes bulls aged 4-5 years had 450-650kg of live weight, and buffalo cows had 350-450kg as averages, but higher than swamp buffalo in China (250kg), and Myanmar (300kg) (Shackleton and Haroldad, 2003).

The results also showed that body dimensions of buffalo bulls at age of 1-2 years were higher than buffalo cows (Table 1). But at age >2 years (Table 2) there was a tendency that body dimensions of buffalo cows were higher than buffalo bulls. Based on coefficient of variation, body dimensions of buffalo bulls and cows in Kabaena island were still quite high, both at the age of 1-2 years and >2 years, except for shoulder and hip heights, with coefficient of variation about <10%.

CONCLUSSIONS

1. The averages of live weight of buffalo cows were higher than buffalo bulls at age of 1-2 years, even at age of >2 years.
2. Variation on live weight of both buffalo bulls and cows in Kabaena island were still high, especially the group of buffalo at age of 1-2 years with coefficient of variation about 29.55% for buffalo bulls and 38.35% for buffalo cows.
3. Variation on all aspects of body dimension of both buffalo bulls and cows in Kabaena island were still high, either buffalo at age of 1-2 years or >2 years, except for shoulder and hip height parameters with coefficient of variation less than 10%.

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Genetic Analysis of Tolaki Chicken During Growth Period

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GENETIC ANALYSIS OF TOLAKI CHICKEN DURING GROWTH PERIOD

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Introduction

Tolaki chicken was an original chicken of Southeast Sulawesi are scattered in several areas such Konawe and South Konawe. Nevertheless the information characteristic of Tolaki chicken as typical chicken in Southeast Sulawesi has not been much reported, either ghenotip and phenotypes character. research that studies the biological and genetic aspects in Tolaki chickens not yet implemented, so that the data potential production , maintenance efficiency has not been much noticed.

As the initial step in this research was conducted to find out the potential of the phenotype and genetic Tolaki chicken during growth, including the potential productivity and reproduktivity.

PROCEDURE

Artificial Insemination

Hatching

Weighting

RESULT

Heritability Value of Body Weight on 0 -12 Week

Age (week)	Heritability		
	h^2_s	h^2_d	$h^2_{(s+d)}$
0	0,28 ± 0,29	-0,05 ± 0,11	0,12 ± 0,13
1	0,39 ± 0,33	0,01 ± 0,08	0,20 ± 0,23
2	0,41 ± 0,35	0,01 ± 0,13	0,21 ± 0,24
3	0,52 ± 0,38	0,15 ± 0,21	0,34 ± 0,31
4	0,70 ± 0,45	0,19 ± 0,13	0,44 ± 0,25
5	0,55 ± 0,42	0,08 ± 0,13	0,31 ± 0,29
6	0,54 ± 0,41	-0,08 ± 0,26	0,23 ± 0,26
7	0,49 ± 0,38	0,05 ± 0,15	0,27 ± 0,27
8	0,49 ± 0,38	-0,25 ± 0,27	0,12 ± 0,13
9	0,39 ± 0,33	-0,24 ± 0,26	0,08 ± 0,14
10	0,30 ± 0,28	-0,18 ± 0,19	0,06 ± 0,12
11	0,39 ± 0,33	-0,20 ± 0,21	0,09 ± 0,16
12	0,27 ± 0,26	-0,23 ± 0,23	0,02 ± 0,07

h^2_s : male component $h^2_{(s+d)}$: male + female component
h^2_d : female component

Heritability Value of Body Weight Gain On 1- 11 Week

Age (week)	Heritability		
	h^2_s	h^2_d	$h^2_{(s+d)}$
0	0,28 ± 0,29	-0,05 ± 0,11	0,12 ± 0,13
1	0,39 ± 0,33	0,01 ± 0,08	0,20 ± 0,23
2	0,41 ± 0,35	0,01 ± 0,13	0,21 ± 0,24
3	0,52 ± 0,38	0,15 ± 0,21	0,34 ± 0,31
4	0,70 ± 0,45	0,19 ± 0,13	0,44 ± 0,25
5	0,55 ± 0,42	0,08 ± 0,13	0,31 ± 0,29
6	0,54 ± 0,41	-0,08 ± 0,26	0,23 ± 0,26
7	0,49 ± 0,38	0,05 ± 0,15	0,27 ± 0,27
8	0,49 ± 0,38	-0,25 ± 0,27	0,12 ± 0,13
9	0,39 ± 0,33	-0,24 ± 0,26	0,08 ± 0,14
10	0,30 ± 0,28	-0,18 ± 0,19	0,06 ± 0,12
11	0,39 ± 0,33	-0,20 ± 0,21	0,09 ± 0,16
12	0,27 ± 0,26	-0,23 ± 0,23	0,02 ± 0,07

h^2_s : male component $h^2_{(s+d)}$: male + female component
h^2_d : female component

Conclusion

Based on the results of research carried out on Genetic Analysis on Growth Period Tolaki Chicken can be summarized as follows:

- Inheritance nature of growth based on the variance components stud (H2S), based on the parent (H2D) and the stud and parent (H2S + d) reasonably fluctuate depicting still vast variance chicken growth properties Tolaki
- Ability heredity stud growth based on the variance components (H2S) from 0 to 12 weeks with a high heritability values and positive values.

Enhancing Local Tropical Beef Cattle Production Supporting Food Security in Indonesia

Endang Tri Margawati

ENHANCING LOCAL TROPICAL BEEF CATTLE PRODUCTION SUPPORTING FOOD SECURITY IN INDONESIA

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LOCAL BEEF CATTLE

As the fourth higher populated country in the world and the increase of Indonesian economic level lately, Indonesia faces several problems as consequences. This paper is restricted pertaining animal production of local beef cattle (and sheep) supporting food security in Indonesia also food self-sufficient and food sovereignty. Animal production is one of components of those matters. Genetic resources of livestock needs to be explored both the existing local beef cattle and their trait superiorities. There are 11 indigenous cattle breeds in Indonesia (Agric Minist's decree, 2010; 2011; 2012; 2014). Two out of 11 breeds are suggested to be important to support the food sufficient from meat sources, i.e., Bali and PO breed cattle. Quantitative performance of both breeds need to be combined with molecular genetic markers. Several genetic markers have been applied to identify and confirm of important traits both in Bali and PO breeds (i.e., growth sheep (Margawati, 2005; Margawati et al., 2011); twinning birth (Margawati et al., 2014[a,b]), meat quality (Margawati, et al., 2014[c]). Other important traits need to be explored such as reproduction, carcass trait in cattle. Our tropical beef breed tends to be less fat deposit and produces more healthy meat. Both breeds are almost preferred by small holder farms since easy to be reared with less grass quality, can consome waste of agriculture crop and rice, also survive under dry and hot weather. Theoretically when those breeds are maintained intensively with good management and better feed they would grow much better.

Molecular genetics-based aporoaches are quicker and better selecting important traits and enhancing our local beef cattle production (Margawati, 2012) subsequently supporting food security. The selected cattle with certain important traits would then be delivered to AI and Breeding Centers. Those centers would spread selected cattle (bearing important genes) to small farmer holders throughout Indonesia. Existing conventional method of AI is still needed to multiply offspring production of selected cows and bulls. Research concerning the important traits of local beef cattle in Indonesia as a tropical country is recommended to enhance animal production for supporting food security, self-sufficient and sovereignty of food.

OBJECTIVES

Exploring animal production of local beef cattle supporting food security in Indonesia

ANIMAL PRODUCTION SUPPORTING FOOD SECURITY

A. GROWTH TRAIT

QTL Analysis, Genome wide scan covered 26 chr. (136 MS markers; 381 sheep population)

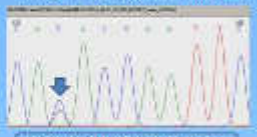
Garut sheep tends to have a better growth by CSSM018 and TMR1 MS markers at chromosome 18

B. TWINNING BIRTH TRAIT IN CATTLE

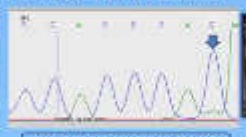
Microsatelitte in PO Breed

No	Primer	Acc. Number	Size (bp.)	Remark
1	AGLA 264	AAFC02042831	158-214	Clear band
2	BM8230	G18789	203-100	Clear band
3	ETH10	222739	212-224	Clear band
4	ISF 1	Y18831	225-231	Clear band
5	BMS1216	G18678	143-165	Clear band
6	BM103	U10351	114-144	Clear band
7	BM121	G18515	108-126	Clear band

Single Nucleotide Polymorphism (SNP) in PO Breed



55057_152 C/G (CSNRP), 700bp



2019_547 C/A (ITGA5), 700bp

Hormonal Approach

Applying of Mild dose PMSG (250, 500, 750 IU) Suggested 750 mild dose PMSG at Lactation 3 could trigger twinning birth in FH cattle

C. MEAT QUALITY TRAIT

***CAST* SNP Primer in Bali cattle**

Bali meat

The research identified 5-point mutations in CAST gene of all samples. One out of 5-point mutations was specific for Bali cattle (C/G at nt 284). It seems that Bali cattle tends to have tenderness trait

CONCLUSIONS

- Bali and PO breed cattle are urgently to be explored for their potential traits
- Several important traits have been studied in local beef cattle
- Advanced technology needs to be followed by AI method for multiply offsprings
- Selected animal with potential traits would contribute to AI and Breeding centers to improve potential genetics in small holder farmers
- Local beef cattle has potential supporting food security
- Indonesian beef cattle could contribute as healthy meat

ACKNOWLEDGEMENT

Several research funds have been possible for the above research. Author thanks to Indriawati, MS., S. Diah Volkandari, MSc., M. Ridwan, SPar. and Hendrie, SE. for their contribution in the Laboratory and field works.

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The Effect of Controlled Internal Drug Release (CIDR) on Concentration of Estrogen Hormone in Different Kacang and Bligon Does

Popalayah, Ismaya, and Nono Ngadiyono

The Effect of *Controlled Internal Drug Release* (CIDR) on Concentration of Estrogen Hormone in Different Kacang and Bligon Does

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PRELIMINARY

Synchronisation estrous activity and ovulation the world livestock is often used breeding programs for implementation productivity. Estrous synchronization using a synthetic progesterone Controlled Internal Drug Release (CIDR) has felt the benefit both groups and domestic animals such goats and sheep conventional and new types of animals such deer. Many aspects of the appearance of local goat reproduction have been investigated, but the information estrogen and progesterone profile on the estrous cycle has not been many reported. so this study attempts to use a single hormone preparations for estrus synchronization in goats with different and estrogen profiles (Gono, *et al.* 2003). This study aims to determine estrogen hormone profiles in Kacang dan Bligon does through synchronization using a single form the preparations hormone progesterone CIDR for 13 days.

RESEARCH METHODOLOGY

The samples used in the study were seventeen does, each seven Kacang and Bligon does and one buck for detect of estrous. CIDR with the content of 0.3 g progesterone performed on each animal for 13 days. Analysis hormone blood collected were does 4 times the day before the installation of CIDR (H0), the day before the release of CIDR (H12), while cattle estrus (H17) and after one estrous cycle (H37). Blood collected from the jugular vein much 3 cc sterile syringe and then placed into EDTA tubes and immediately disentrifuge with speed 3000 rpm for 10 minutes. The plasma then separated and stored in evendof or separate small tubes and stored at refrigerator 20 ^{0}C of temperature to estrogen test done. Serum estrogen concentrations in each animal calculated were measured *ELISA* method.

RESULTS AND DISCUSSION

concentration of estrogen hormone was does varies. In kacang does, the highest figure shows the H17 or goats estrus when estrogen concentrations of 183.74 ± 149.16 pg/mL and the lowest day before the installation of CIDR 108.50 ± 50.0 pg/mL. This figure is almost equal to the concentration of the hormone estrogen after one estrous cycle ie 109.17 ± 60.8 pg / mL. Concentration of the hormone estrogen in bligon goats was highest H0 or the day before CIDR installation of 126.27 ± 60.26 pg/mL.. the concentration of the estrogen of estrous in bligon does 108 129 ± 59.02 pg/mL. Serum concentration of estrogen due to growth of follicles that are not similar between treatment groups and therefore contributes to the growth of the follicle and can also because the influence of body condition and nutrition. The high estrogen concentration a difference in each cattle probably caused difference capabilities to producing estrogen among individuals.

Concentration of estrogen in each individual is quite different. does which indication of estrus have estrogen concentration ranging from 20.17 pg / ml – 60,163 pg / mL were does of estrous ranged between 124 estrogen hormone concentrations, 94.127 pg/mL - 418.368 pg / mL. The big difference in concentration estrogen in this study, show that the same time there are differences in the amount of estrogen hormone concentrations of each cattle it depends also on the type of goats, race and age of the goats well as time measurement.

CONCLUDED

It was concluded this research that the use of CIDR for synchronizing estrous in Kacang and Bligon Does showed that Hormone profile the concentration of estrogen in both types of goats after CIDR implant is different, where the estrogen hormone concentration in kacang does higher than bligon does.

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Epididymal Sperm Maturation Level of Bali Cattle Based on The Presence of Cytoplasmic Droplet

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ABSTRACT

Maturation of spermatozoa was characterized by the migration of cytoplasmic droplet from neck position (proximal droplets) toward the tail end (distal droplet) of spermatozoa. The purpose of this research was to evaluate the percentage of spermatozoa that had cytoplasmic droplet derived from caput, corpus and cauda epididymis. Thirty-two testes of Bali cattle aged between 2-5 years were used in this experiment. Spermatozoa aspirated from each region of testical epididymis were smeared on slide glass, stained and dried prior to observation under microscope using 40x magnification. Two hundred spermatozoa in each slide were identified for the presence of cytoplasmic droplet and the position of cytoplasmic droplet in sperm tail (neck, middle and tail end). Data of cytoplasmic droplet in each region of epididymis were compared using t test. The results showed that the percentage of spermatozoa that had cytoplasmic droplet derived from caput, corpus and cauda epididymis were 80.87%, 70.56% and 22.44%, respectively. The percentage of spermatozoa in which cytoplasmic droplet located in neck, middle, and tail end were 40.50%, 37.30%, and 3.07% for caput epididymis, 30.54%, 35.33%, and 4.69% for corpus epididymis, and 9.33%, 11.22%, and 1.89% for cauda epididymis, respectively. The percentages of spermatozoa that had cytoplasmic droplet were higher in caput compared to corpus and cauda of epididymis.

Key Words: Bali Cattle, Cytoplasmic Droplet, Spermatozoa, Cauda, Corpus, Caput Epididymis

Epididymal Sperm Maturation Level of Bali Cattle Based on the Presence of Cytoplasmic Droplet

Rina Sumiarti[1], La Ode Baa[1] Takdir Saili[1]

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SUMMARY

Maturation of spermatozoa was characterized by the migration of cytoplamic droplet from the neck position (proximal droplets) toward the tail end (distal droplets) of spermatozoa. The purpose of this research was to evaluate the percentage of spermatozoa that had cytoplasmic droplet derived from caput, corpus and cauda epididymis. Thirty two testes of Bali cattle aged between 2-5 years were used in this experiment. Spermatozoa aspirated from each region of testical epididymis were smeared on slide glass, stained and dried prior to observation under microscope using 400x magnification. Two hundred spermatozoa in each slide were identified for the presence of cytoplasmic droplet and the position of cytoplasmic droplet in sperm tail (neck, middle and end tail). Data of cytoplasmic droplet in each region of epididymis were compared using t test. The results showed that the percentage of spermatozoa that had cytoplasmic droplet derived from caput, corpus, and cauda epididymis were 80.87%, 70.56%, and 22.44%, respectively. The percentage of spermatozoa in which cytoplasmic droplet located in neck, middle, and tail end were 40.50%, 37.30%, and 3.07% for caput epididymis, 30.54%, 35.33%, and 4.69% for corpus epididymis, and 9.33%, 11.22%, and 1.89% for cauda epididymis, respectively. The percentages of spermatozoa that had cytoplasmic droplet were higher in caput compared to corpus and cauda of epididymis.

METHODOLOGY

RESULTS

Cytoplasmic droplet on different parts of epididymis (caput, corpus and cauda) of Bali cattle

Cattle Ages (Years)	Parts of testes	Sitoplasmic Droplet		
		Caput	Corpus	Cauda
2	Left	84	67	17
3	Left	83	70	21
4	Left	80	69	23
5	Left	83	70	19
Averages	**Left**	**82.50**	**69.00**	**20.00**
2	Right	81	72	24
3	Right	80	73	25
4	Right	76	70	26
5	Right	80	74	24
Averages	**Right**	**79.25**	**72.25**	**24.75**
Averages		**80.88[a]**	**70.63[b]**	**22.38[c]**

Position of cytoplasmic droplet across the spermatozoa tail of caput, corpus and cauda epididymis-derived spermatozoa

Cattle Ages (Years)	Parts of Testes	Cytoplasmic Droplet								
		Caput			Corpus			Cauda		
		Neck	Middle	End	Neck	Middle	End	Neck	Middle	End
2	Left	43	39	2	29	36	3	8	9	1
3	Left	42	38	3	30	36	4	10	10	1
4	Left	38	37	4	30	34	5	9	11	3
5	Left	42	37	4	31	33	5	8	10	2
Averages	**Left**	**41.25**	**37.75**	**3.25**	**30.00**	**34.75**	**4.25**	**8.75**	**10.00**	**1.75**
2	Right	41	38	2	30	38	5	10	12	1
3	Right	40	37	3	31	37	5	10	13	2
4	Right	37	35	4	30	35	5	10	13	3
5	Right	41	36	3	33	33	6	10	13	2
Averages	**Right**	**39.75**	**36.50**	**3.00**	**31.00**	**36.25**	**5.25**	**10.00**	**12.75**	**2.00**
Averages		**40.50[a]**	**37.13[a]**	**3.13[c]**	**30.50[b]**	**35.50[a]**	**4.75[c]**	**9.38[b]**	**11.38[b]**	**1.88[c]**

CONCLUSSIONS

1. Spermatozoa with cytoplasmic droplet in caput and corpus epidyimis were significantly higher than spermatozoa derived from cauda epididymis of Bali cattle.
2. Position of cytoplasmic droplet in spermatozoa derived from caput and corpus epididymis were higher in neck and middle position compare to end tail position.
3. Based on number and poisition of cytoplasmic droplet, spermatozoa derived from cauda epididymal was more mature than spermatozoa derived from caput and corpus epididymis.

The Effect of Storage Period on Chemical Composition of Hydrolized Feeds for Broiler

Denvy Meidian Daoed, A. M. Tasse, and A. Indi

INTERNATIONAL SEMINAR
FACULTY OF ANIMAL SCIENCE
HALU OLEO UNIVERSITY

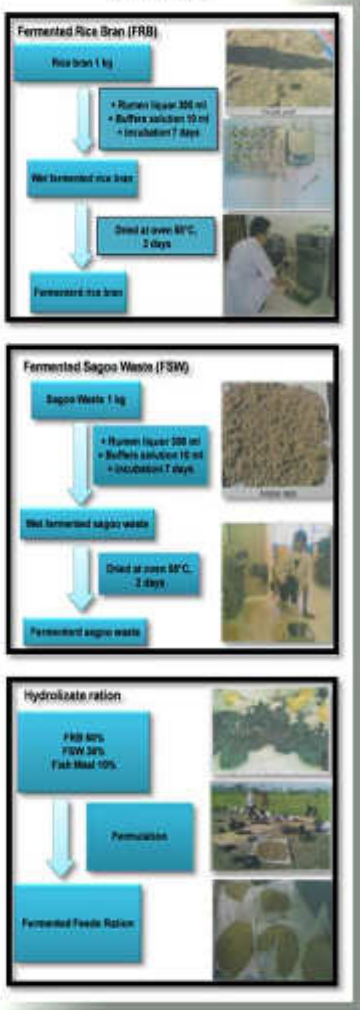
THE EFFECT OF STORAGE PERIOD ON CHEMICAL COMPOSITION OF HYDROLYZED FEEDS FOR BROILER

Denvy Meidian Daoed, Andi MurlinaTasse, Amiluddin Indi
Faculty of Animal Science.Halu Oleo University

SUMMARY

The experiment was aimed to study the effect of storage period on chemical composition of hydrolyzed feeds for broiler. The experiment was conducted at November 2013 at Laboratory of Animal Science, Faculty of Animal Science, Halu Oleo University, Kendari. Fermented feeds i.e rice bran, sagoo waste and fish waste was fermented using rumen liquor during 3 days. The hydrolyzed feeds was stored during 0, 1, 2, 3, and 4 weeks. Chemical composition consist of water, ash, crude protein, ether extract and crude fibre of fermented feeds. The data was analyzed using Analisis of Variance based on Completely Randomized Design and Duncan Multiple Range test. The results showed that the storage period gave a significant effect ($p<0,01$) on water, ash, protein, ether extract and crude fibre of hydrolyzed feeds. Increasing of storage period was followed by increasing of water and ash content of hydrolyzed feeds but decreasing crude protein, ether extract and crude fiber content. The conclusion of this experiment is storage period during 0, 1, 2, 3 and 4 weeks on 39°C of storage temperature increased the water and ash content but decreased the crude protein, ether extract and crude fibre content of hydrolyzed feeds.

METHOD



RESULT

Variables	T1	T2	T3	T4	T5
Water (%)	5,57^{a} ± 0,67	9,77^{b} ± 0,72	10,74^{b} ± 0,15	11,40^{c} ± 0,25	12,50^{d} ± 0,00
Ash (%)	8,14^{a} ± 0,15	8,80^{b} ± 0,17	8,93 ^{bc}± 0,12	9,27^{c} ± 0,15	10,50^{d} ± 0,10
Crude protein (%)	20,50^{d} ± 0,00	17,63^{c} ± 0,15	16,23^{b} ± 0,06	15,87^{b} ± 0,06	15,90^{b} ± 0,00
Ether Extract (%)	3,37^{c} ± 0,15	3,00^{b} ± 0,20	3,30^{b} ± 0,10	2,47^{a} ± 0,12	2,70^{a} ± 0,10
Crude Fibre (%)	9,40^{e} ± 0,36	8,50^{d} ± 0,10	7,33^{c} ± 0,40	6,20^{b} ± 0,10	5,57^{a} ± 0,21

CONCLUTION

The conclusion of this experiment is storage period during 0, 1, 2, 3 and 4 weeks on 39°C of storage temperature increased the water and ash content but decreased the crude protein, ether extract and crude fibre content of hydrolyzed feeds.

Performance of Kampong Chicken Fed Fermented Fish Meal With Different Fermenter

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[1]Postgraduate Program in Animal Science, Universitas Halu Oleo, Kendari
[2]Faculty of Animal Science, Universitas Halu Oleo, Kendari

ABSTRACT

The experiment aimed to observe performance of Kampong chicken fed fermented fish meal (FFM) with different fermenter during 8 weeks. One hundred DOC was allocated at 20 cages. Variables were feed intake, gain, feed conversion, slaughter weight, carcass weight, carcass percentage, commercial carcass weight and percentage. Data were collected and subjected to analysis of variance (ANOVA) of the completely randomized design and Tukey test. The treatments were T1 (non fermented fish meal/non FFM)), T2 (FFM rumen liquor), T3 (FFM *Rhizopus sp*.), T4 (FFM *Saccharomyces cereviceae*). The result of statistical analysis showed that FFM in the rations, significantly influenced ($P<0.05$) on gain, feed conversion, commercial carcass weight and percentage but did not significantly influenced ($P>0.05$) on feed intake. It can be concluded that T3 (FFM *Rhizopus sp*.) and T4 (FFM *Saccharomyces cereviceae*) showed the best on gain (88,94;88,85g/chickens), feed conversion (2,72;2,95) thus T3 on commercial carcass weight (503,70g/chickens) and T4 on commercial carcass percentage (58,76%).

Key Words: Kampong Chicken, Fermented Fish Meal, Feed Conversion, Commercial Carcass Percentage

Performance of Kampong Chicken Fed Fermented Fish Meal with Different Fermenter

Asnawar[1], La Ode Nafiu[2], Andi Murlina Tasse[2]
[1]Postgraduate Program in Animal Science, Universitas Halu Oleo, Kendari
[2]Faculty of Animal Science, Universitas Halu Oleo, Kendari

SUMMARY

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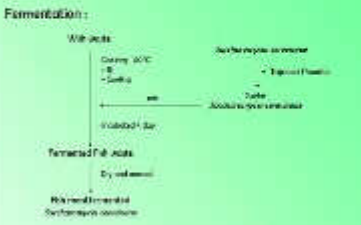
MATERIALS AND METHODS

Fermentation :



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RESULTS AND DISCUSSION

Parameter	Feed intake (g/ekor)	Gain (g/ekor)	Convertion	Slaughter weight (g/ekor)	Carcas Weight (g/ekor)	Carcas percentage (%)
T1	222,69	70,56	3,12	724,70	422,60	58,30
T2	242,25	86,39	2,92	782,10	464,80	59,41
T3	239,03	88,94	2,72	850,80	503,70	59,28
T4	235,86	88,85	2,95	810,20	476,10	58,76

CONCLUSION

Fermenters *Rhizopus sp.* and *Saccharomyces cerevisiae* to fermentation fish wase showed the best on gain (88,94 g/week; 88,85 g/week), feed conversion (2,72 ; 2,95) thus T3 on commercial carcass weight (503,70 g) and T4 on commercial carcass percentage (58,76 %) of Kampong chicken.

The Effect Chitosan Supplementation in The Diet on Fat and Cholesterol Levels of Duck Blood

Surahmanto, A. Pagala, N. Sandiah, and Fitrianingsih

CHITOSAN SUPPLEMENTATION IN THE DIET OF FAT AND CHOLESTEROL LEVELS OF DUCK BLOOD.

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SUMMARY

This study aims to determine the diet that supplementation of chitosan extracted from shrimp head waste of skin and shell crab on blood cholesterol levels and duck fat. The research animals faculty, department of fisheries laboratory, chemistry laboratory, and southeast Sulawesi health office laboratory. The study is based on completely randomized design, and if treatment will significantly further test leas significant difference (LSD). This research was conducted with 3 replications and 4 treatment. Where R1 is no treatment (control) 100% basal diet, R2 = basal diet + 0.5% chitosan, R3 = basal diet + 1 % chitosan, and R4 basal diet + 1,5% chitosan. The parameter measured were blood cholesterol levels, triasilgliserida, HDL, and LDL ducs. Based on the analysis range of treatment with chitosan supplementation in the significantly ($P < 0,05$) on blood cholesterol levels of duck with the highest average value obtained from each treatment were R1 = 148,67mg/dl, R2 = 144,33 mg/dl, R4 135,33 mg/dl, a dan R3 = 134,67 mg/dl. The results of analysis that shows the range of chitosan supplementation in the diet significantly ($P < 0.05$) on of triasilgliserida duck with the highest average is R1 = 127,67 mg/dl, R2 124,33 mg/dl, R3 = 102,67 mg/dl, and R4 = 117 mg/dl variety of analysis that showed that chitosan supplementation in the diet significantly ($P < 0,05$) on HDL levels duck with the highest average is R4 = 45 mg/dl, R3 = 42,67 mg/dl, R2 = 32 mg/dl, and R1 = 31,33 mg/dl. In conclusion of of this study was chitosan supplementation in the diet had significant effect on blood cholesterol levels of duck, where the optimal level of use chitosan is at the level of 1%.

PROCEDURE

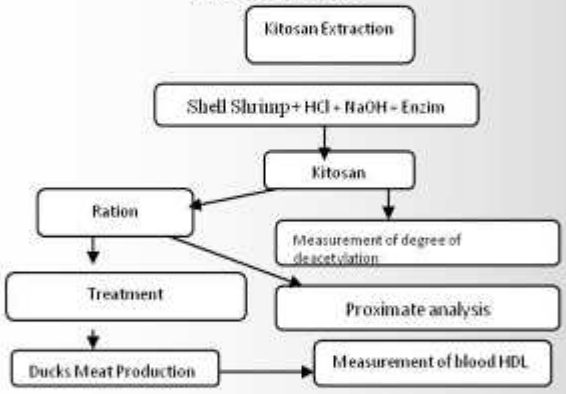

Figure 1. Schematic of Research Activities in the chitosan supplementation ration Against Fat And Cholesterol Levels Blood Ducks

RESULT

Table 1. Cholesterol levels in the blood of ducks (Mg / dl) were given chitosan supplementation in the diet

Repetition	Treatment			
	R1	R2	R3	R4
I	180	133	156	140
II	163	152	143	131
II	103	148	105	135
Mean	148,67	144,33	134,67	135,33

Table 2. Triasilgiserida levels in duck blood (mg / dl) were supplemented with chitosan in the ration

Repetition	Treatment			
	R1	R2	R3	R4
I	108	122	128	130
II	169	131	85	125
II	106	120	95	96
Mean	127,67	124,33	102,67	117

Table 3. Levels of HDL in the blood of ducks were given supplementation of chitosan in the ration

Repetition	Treatment			
	R1	R2	R3	R4
I	31	33	45	53
II	31	31	51	32
II	32	32	32	50
Mean	31,33	32	42,67	45

CONCLUTION

- Supplementation with chitosan at various levels in the ration ducks significant effect on the binding of cholesterol levels and blood fat ducks.
- Chitosan supplementation in the diet can raise levels of HDL (good koleseterol) duck blood
- Chitosan can bind optimal lipid levels and blood cholesterol ducks by administering chitosan 1% in the ration.

Description:
R1 = 100% Basal ration
R2 = Basal ration + 0.5% Chitosan
R3 = Basal ration + 1% Chitosan
R4 = Basal ration + 1.5% Chitosan

The Using of Protected Fatty Acid Supplement to Improve Carcass Percentage of Broiler Chicken

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ABSTRACT

The research was aimed to know the percentage carcass of broiler with ration supplementation of protected fatty acid. The sample used in this research is 48 broiler chickens unsexed strain avian CP707 production of PT. Charoen Phokhpand Makassar divided in 12 plots enclosure 1x1 meters. The design of this research is a Completely Randomized Design with 3 treatments and 4 replications. The treatments were T0 = commercial ration BP-11, T1 = T0+3% dry carboxylate salt mixed (DCM), T2-T0+3% coconut oil hydrolisate. Variables measured were weight gain (kg), weight carcass (kg) and percentage carcass (%). Data were analyzed by variance analysis and continued by orthogonal contrast test. The conclusion showed that (1) ration with supplementation 3% dry carboxy late salt mixed give result 2,00±0,04 kg weight gain, 1,34±0,05 kg weight carcass and 66,88±2,19% percentage carcass, (2) ration with supplementation 3% coconut oil hydrolisate give result 1,91±0,05 kg weight gain, 1,29±0,0,07 weight carcass and 67,28±2,29% percentage carcass, (3) ration with 3% supplementation of protected fatty acid cannot improve weight gain, weight carcass and percentage carcass broiler chicken.

Key Words : Fatty Acid, Weight Gain, Weight Carcass, Percentage Carcass, Chicken Broiler

INTERNATIONAL SEMINAR
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Using Of Protected Fatty Acids Suplement To Improve Carcass Precentage Of Broiler Chicken

Fuji Astuti Anza[1], Andi Murlina Tasse[2], Wa Iaili Salido[1], and Astriana Napirah[1]
[1]Animal Science Faculty, Halu Oleo University

ABSTRACT

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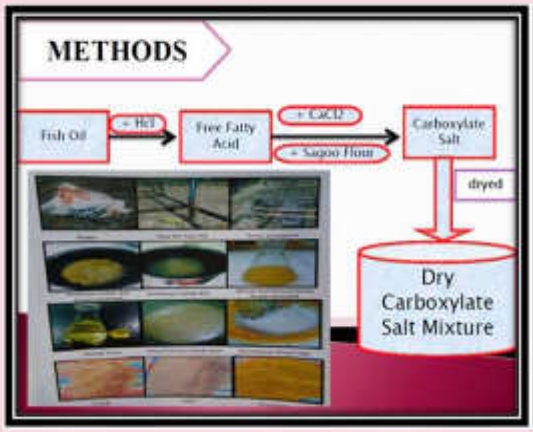
METHODS



RESULT

Variables	T1 (Control)	T2 (3% DCM)	T3 (3% COH)
Weekly gain (g)	1,75	2,05	1,90
Carcass weight (g)	1,70	2,00	1,85
Carcass Percentage (g)	1,80	1,95	1,95

CONCLUTION

Suplementing 3% protected fatty acid (3% DCM or 3% COH) in ration have not improved weakly gain, carcass weight, and carcass percentage broiler chickens.

In Vitro Effects of Oligosaccharides on Bacterial Concentration and Fermentation Profiles in Dairy Calf Colon Content

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ABSTRACT

Some oligosaccharides have been shown to modify colonic micro flora composition and activity in many humans and some animal species. Some oligosaccharides tend to elevate beneficial bacteria and the others depress harmful bacteria in gastrointestinal tract. However, little data are available on their fermentation characteristics by the ilea microbial community, and their effects on the colon micro flora composition. The aim of this study was to evaluate the in vitro effect of oligosaccharides from apple and banana peel extraction and mannan-oligosaccharide (MOS) commercial on concentrations of the total anaerobic bacteria, Bifidobacterium, Lactobacilli, Coliform and Escherichia coli population in dairy calf' colon contents. Two groups of 2 calves fed a milk replacer (1 week old) and fibrous pellets (3 weeks-old) were sacrificed 5 h after the morning meal. In each group, colon content were pooled and diluted with, diluted by Lowe medium. Extraction of apple, banana peel, and MOS were tested in vitro versus a control. Each bottle was incubated in duplicate for each treatment and at 37^0C in a shaking water bath. Bacterial concentrations were determined at 48 H and inoculated in selected media for each bacteria group and supernatant were taken for fatty acids (VFA) measurement. Result showed in general, oligosaccharides were not resulted VFA concentration than control bottle in both groups even tend to inclined, specifically banana peel. Apple peel and banana peel slightly increase total anaerob and lactobacilli in both group but could not depress the E. coli. On the other hand MOS seems the most effective in depressing coli. Based on our results, oligosaccharides were fermented by bacteria of ilea contents in dairy calves and its fermentation led to a selective stimulation of host bacteria.

Key Words: Oligosaccharides, Dairy Calf, Colon, Selective Media

The Effect of LAB Inoculants on The Chemical and Microbial Composition in Fermentation of TMR Silage

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ABSTRACT

The effect of applying lactic acid bacteria (LAB) at ensiling on the nutrition and microbial composition in fermentation total mixed ration (TMR) silage was studied under laboratory conditions. The LAB inoculants consisted of *Lactobacillus plantarum* (P1) commercial and two others Lactobacillus that isolated from local corn leaf (P2 and P3) in experiments with TMR (11% CP and 68% TDN). The inoculants were applied each at about 10^6 cfu g. After treatment, the TMR were ensiled in 1 lt anaerobic jars. Six jars per treatment were sampled on days 21. At the end of the experiment, the silages were subjected to chemical and microbiological parameters, to determine the nutritive value and contaminant microbes compare with no LAB inoculation. In TMR silages, the LAB inoculants did not affect the nutritive value (dry matter, organic matter, crude protein, extract ether, and crude fiber) however its increase LAB population and depress the contaminant microbes (aerob bacteria, yeast, and clostridia). Inoculants P3 from corn leaf seem to have the most potential in protecting TMR from undesirable microbes.

Key Words: LAB, Chemical and Microbial Composition, TMR, Silage

The Effect of Soaking Period on Chemical Quality of Gelatin Derived From Broiler Leg Skin

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ABSTRACT

Gelatin is usually used for the healthcare industry, photographic industry, and food industry. However, many the gelatin were still imported from abroad that not surely "halal", so it necessary to produce our own gelatin. The product of gelatin this experiment used 2%NaOH with different soaking periods. The objective of this experiment was to determine the quality base-based gelatin produced from the skin of broiler legs. Completely randomized design with three treatment of soaking periods (1 day, 2 day and 3 day)used in this experiments with three replications. Variable measured were pH, water content, fat and inorganic material (ash). Data obtain were analyzed using variance analysis and different between treatments were analyzed using multiple range Duncan test. The result showed that periods did not significantly affect the quality of gelatin derived from the skin of broiler legs.

Key Words: Gelatin, Broiler Legs, Soaking, NaOH

THE EFFECT OF SOAKING PERIODS ON CHEMICAL QUALITY OF GELATIN DERIVED FOR BROILER LEGS SKIN

(PENGARUH PERENDAMAN BASA TERHADAP KUALITAS KIMIA GELATIN KULIT KAKI AYAM)

ELEN ROSALIA JOKA 1), HARAPIN HAFID 2) DAN TAKDIR SAILI 2)
1)ALUMNUS JURUSAN PETERNAKAN FAKULTAS PETERNAKAN UHO
2) DOSEN JURUSAN PETERNAKAN FAKULTAS PETERNAKAN UHO

ABSTRACT

Gelatin is usually used for the healthcare industry, photographic industry, and food industry. However, many the gelatin were still imported from abroad that not surely "halal". So it necessary to produce our own gelatin. The product of gelatin this experiment used 2%NaOH with different soaking periods. The objectives of this experiment was to determine the qualitybase-based gelatin produced from the skin of broiler legs. Completely randomized design with three treatment of soaking periods (1 day, 2 day and 3 day)used in this experiments with three replications. Variable measured were pH, water content, fat and inorganic material (ash). Data obtain were analyzed using variance analysis and different between treatments were analyzed using multiple range Duncan test. The result showed that periods did not significantly affect the quality of gelatin derived from the skin of broiler legs.

Keywords : Gelatin, broiler legs, soaking , NaOH .

INTRODUCTION

One of broiler chicken waste that very abundant was chicken legs. Usually the broiler chicken leg is less attractive to consumers because it contains less meat and more skin and bones. Broiler chicken leg contains a lot of protein in the skin muscles, as known as collagen. Collagen is a fibrous protein that is insoluble in the main role in the extracellular matrix and in the connective tissue (Soepamo, 2011). Therefore, there should be an investigation to determine the quality of gelatin derived from waste broiler chicken farms

METHODOLOGY

This research was conducted for two months in April to May 2014 in Analytic Chemistry Lab F-University of Sciences Haluan Oleo Kendari.

Procedure

- Preparation of raw materials and the process of separation of skin from shank
- The Process Of Extraction Of Skin
- The process of changing into a gel gelatin

The treatment is applied to the research of the long soaking the skin in broiler chicken legs 2% NaOH solution, namely:

P1 = Long Soaking 1 day
P2 = Long Soaking 2 days
P3 = Long Submersion in 3 days

CONCLUSION

Based on the results of the research can be disimpulan that the long soaking treatment of one to three days in a solution ofalkaline NaOH 2% not giving real effect to the quality of chemical skin gelatin broiler chicken legs.

RESULT

Tabel 1. pH rate (acidity)Gelatin

Repetition	Treatment		
	Soacking time (day)		
	1	2	3
1	8.2	8.89	9.28
2	8.56	9	9.24
3	8.76	9.02	9.18
Rate	8.51 ± 0.28	8.97 ± 0.07	9.23 ± 0.05

Description: Unsignificant ($p>0.05$)

Tabel 2. Moisture Content Of Gelatin

Repetition	Treatment		
	Soacking time (day)		
	1	2	3
1	6.49	8.19	5.93
2	9.09	7.68	5.79
3	6.77	6.84	8.06
Rataan	7.45 ± 1.43	7.57 ± 0.68	6.58 ± 1.27

Description: Unsignificant ($p>0.05$)

Tabel 3. Fat Content Of Gelatin

Repetition	Treatment		
	Soacking time (day)		
	1	2	3
1	19.58	17.46	20.13
2	9.97	15.88	12.19
3	11.91	17.66	12.92
Rate	13.82 ± 5.08	16.99 ± 0.98	15.28 ± 4.19

Description: Unsignificant ($p>0.05$)

Tabel 4. Ash content of gelatin

Repetition	Treatment		
	Soacking time (day)		
	1	2	3
1	9.22	9.61	9.74
2	12.51	10.19	8.39
3	11.92	11.35	10.00
Rate	11.22 ± 1.75	10.38 ± 0.89	9.38 ± 0.86

Description: Unsignificant ($p>0.05$)

The Effect of Sweet Potato Flour, *Kabuto*, and Sago on Broiler Chicken Meat Ball Quality

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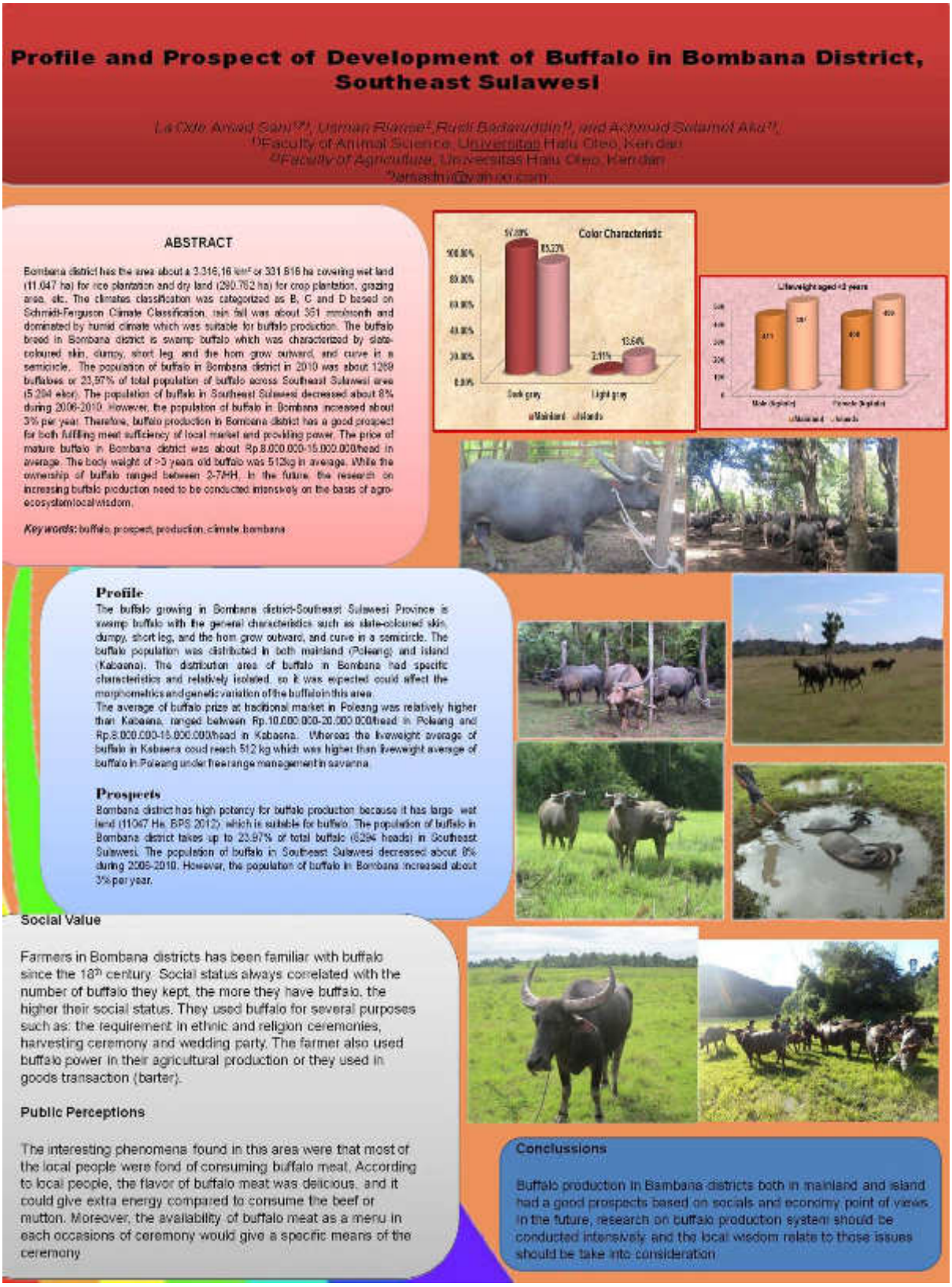
ABSTRACT

This study was aimed to produce processed meat of broiler chicken with a better quality and to evaluated consumer acceptability on broiler chicken meat ball that use white sweet potato flour, *kabuto* flour, and sago flour as filler. This study used Completely Randomized Design (CRD) with 3 treatments and 4 replications. The treatments were the using of white sweet potato flour (B1), kabuto flour (B2), and sago flour (B3) as much as 20%. The observed parameters were physical quality test (cooking loss and pH) organoleptic evaluation (color, shape, texture, aroma, fracturing power, supplenes, flavour, compactness, attractiveness, and acceptability), and chemical composition (water, ash, fat, and protein content) of broiler chicken meat ball. For organoleptic testing, Scoring Different test was used with 25 panelist. Result of this study showed that the using of white sweet potato, kabuto, and sago flour did not affect cooking loss but affect the pH of broiler chicken meat ball. The using of three different flour did not affect shape, aroma, texture, falvour, fracturing power, compactness, and actractiveness, but affect the color and supplenes of broiler chicken meat ball. Broiler chicken meat ball with kabuto and sago flour were quite favored by panelist. The result of chemical composition analysis showed that using white sweet potato, kabuto, and sago flour did not affect the protein and ash content, but affect the water and fat content of broiler chicken meat ball.

Key Words: Meat Ball, Physical Quality, Organoleptic Quality, Chemical Quality, White Sweet Potato Flour, Kabuto Flour, Sago Flour

Profile and Prospect of Development of Buffalo in Bombana District, Southeast Sulawesi

La Ode Arsad Sani, U. Rianse, R. Badaruddin, and A. Selamet Aku



Identification of Farmers Knowledge on Rice Straws Technology for Beef Cattle Development in Enrekang Regency

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ABSTRACT

The objective of this study was to identify the farmers knowledge in utilize of the rice straws to have value added through innovative processing technologies for the development of beef cattle. This study was conducted in Sub-district of Maiwa, Enrekang Regency, South Sulawesi. Determination of farmers as respondents was randomly based on the Slovin method. The number of respondent was 60 farmers. Data was collected through survey research using data collection techniques such as interviews and questionnaire, focus group discussion and in depth interview with key informants. The results of this study showed that, in general (90% of the respondents) the farmers know the information regarding rice straws technology. However, it was only 46.9% of the respondents apply this technology for their cattle. As conclusion, it is necessary to improve and to optimize in applying rice straws technology for development of beef cattle in smallholder farms.

Key Words: Knowledge, Farmer, Beef Cattle, Technology, Rice Straws

Exploring Dairy Farmer's Knowledge and Practices of Manure Management in Enrekang Regency

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ABSTRACT

The consequency of the increasing of dairy cattle population in Enrekang is environmental pollution from manure. The objective of this research was to explore dairy farmer's knowledge and practices of manure management in Enrekang Regency. The design of research was survey with 79 respondents from a total of 460 dairy farmers that divided by 65 respondents was small scale (1-3 heads each farmer) and 14 respondents was medium scale (more than 3 heads each farmers). Data were obtained through interview and observations using questionnaire with open and close question complementary. Factors of farmer's knowledge were method and advantage of manure management, economic value of manure, farmer's need and advantage of organic fertilizer. Factors of farmer's practices were cleaning intensity of barn and dairy cattle, manure management and the use of manure. The data were analyzed with descriptive statistic using frequency distribution and chi square. Farmer's knowledge of manure management was the same between medium and small scale ($\chi > 5\%$). The knowledge of economic value, advantage of organic fertilizer and manure management was high while method of manure management and farmer's need of organic fertilizer was medium. Cleaning intensity of barn and dairy cattle was high while practice of manure handling and manure using was law (rarely).

Key Words: Knowledge, Dairy Farmer, Manure

The Analysis of The Beef Cattle Development Policy by Means of Social Aid Program in Gorontalo Province

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ABSTRACT

The aims of the study were to analyze the implementation of the policy, to formulate the alternative decision, and to analyze the priority of decision for the beef cattle development policy by means of social aid during six months, June untill November 2015. The population were the institutions related to the beef cattle development policy. The samples were the part of the related institution. The primary data were collected by using interview and questionnaire. The respondents were the leaders of the examined samples. The secondary data were collected by observation and documentation. The data were analyzed by using prescriptive analysis and *Analytic Hierarchy Process* (AHP) was assistanced with *Expert Choise*. The result of the study indicates that the values of the beef cattle development policy face social problem are 0,755 and the economic problem is 0,245. The policy decision priority: 1) Government commitment [0,421], 2) Farmer assistance [0,204], 3) Stakeholder coordination [0,202], and 4) Banking financing [0,173].

Key Words: Policy, Beef Cattle, Social Aid