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The Paradox of Nutrient Fulfilement and Immunity Challenge on Chicken Livestock Development in Tropical Humid Regions

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Abstract

This study aimed to explore the situation of native chickens development in the tropical humid regions especially in Minahasa regions, Nord Sulawesi Indonesia. The survey method was used in 122 farmers selected by sampling purposive design. The results show that in general the farmer in small scale has only under 40 chickens with high risk of dangerous diseases on their animals, exclusively the local nutrition resources are abundantly available in the regions of Minahasa. This condition is related to the availability of feed stuffs derived from plants which are easy to cultivate, and therefore the raw materials are continuously available. If it is associated with animal production such as fish species of marine waters than the poultry farms are guaranteed to have the good quality of feed stuffs. This is also become the reason in this region to develop the poultry farming which the raw materials for rations formulation to fulfil the nutrition needs for the animalslivestock. The biodiversity of plants in this area, also support the fulfilment of nutrients for livestock in the areas. But on the other hand the challenge faced is the high humidity in the tropical humid region allows the development and spread of pathogenic microorganisms that can threaten the poultry farms development in this area.

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Keywords:Small-scale; native chickens; nutrients; pathogenic agents

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1. Introduction

A paradox when the natural resources available for animal feed chickens, are sufficient and continuous available but its immunity are often encounter problems. Small-scale chicken farms, are often get into this problem. These type of farms are common found in many humid tropical regions, which maintained by the community of low or middle economic level. Their hope is to improve the business to the higher scale, but in reality this expectation is difficult to be realized because of farm health problem. In Indonesia, for example, the large scale of chicken farms is not common when compared to the small-scale farm (Prayogi, 2011). Among the poultry farming, the native chickens is the most promoted by the farmer in the villages (Adjid et al., 2006).

The Healt problems in small-scale poultry farmsare very generally comming from the direct contact of animals to the ground in a semi-intensive poultry farms, which allow all animals to be infected by pathogenic microbes and other various types of parasites. Small-scale chicken farms like this are very common cultivated by the people in the village. The most part of this livestock type is possessed by the people in a low or middle of economic level with their limit of skills.

Therefore they need training and assistances about poultry livestock improvement that adaptive to their environment condition and so it can help them to improve their family economy and well-being (van Eekeren et al., 2004). If this situation is related to the reality in the field, it appears that although his animal gets enough ingredients the animals confronted with a very high risk to be infected from many poultry disease. One of the important factor is the animals has antibody insufficient to defence their self against pathogenic micro-organism in the tropic humid area (Jeffrey et al., 1998). The natural resources in humid tropical areas, plants and fishes, become important raw materials to make a ration for native chicken livestock, especially in regions of Indonesia which are available in large numbers and continuous. Overview of some local production plant sources in Indonesia in the year of 2012 to 2014 tended to be stable. In 2014 for example, corn reached 19,032,677 metric tons per year, cassava 23,458,128 metric tons per year. To make animal feed is supported by marine fisheries production for example for fish catching in 2013 reached 6,105,225 metric tons which increased about 700,000 metric tons compared to the year 2012 (BPS, 2014).

The availability of such materials provides a great opportunity to fulfil the nutrient needs of chicken, especially the native chicken farms in a small-scale undertaken by the most of the people which are in small or medium level of economic.

2. Research Method

This research was conducted in the year of 2012 to 2014 by using a survey method on 122 farmers, under purposive sampling design, who carry traditionally on small-scale local chicken in the various villages in the regions of South Minahasa, North Minahasa, Center Minahasa, and Tomohon. The data was obtained through interviews and direct observation in the field and analized with qualitative and quantitative approaches. The data taken include the number of animals per farmer respondents, fulfilling the nutritional needs of animal, rearing to control the potential spread of disease, which this data were divided into several categories according to the type of tradition cultivated: a). Continuously cultivated in a pen; b) Released freely– only at night entered in a cage, and c). Released freely in the day and without cage at night, the chickens seeking shelter they self around livestock, almost of them used tree branches as shelter at night.

Score assessment of maintenance pattern was divided into five levels (L): L1 with a score of 60 if farmers applied good nutrition to their animals, and the application of chickens disease prevention programs and infectious disease case care are well performed in a good manner; L2 with a score of 50 if found if the farmer applied good nutrition to their animals, with good application of chickens disease prevention programs but they did not have skill to treat in case the infectious disease happened to their poultry; L3 with a score of 40 if found good nutrition, and the disease prevention application running but disorganized, and they did not have skill to treat in case infectious disease happened to their poultry; L4 with a score of 30, if found good nutrition but no disease prevention programs, neither the skill to treat in case infectious disease happened to their poultry; L5 with a score of 20 if found not good nutrition, no disease prevention programs, neither the skill to treat in case infectious disease happened to their poultry. Statistical analysis-test applied for compare mean of categories data according to the number scale of

animals per farmer, animal nutrition fulfillment in two level: good and less nutritious. General Linear Model (GLM) applied to analyze the variance of scores rearing to control the potential spread of disease, according to the procedure of Zar (1996). The frequency distribution of three main dangerous diseases found in the field, presented in pie chart by percentage.

3. Results and Discussion

3.1. The Situation of Native Chicken, Traditionally Maintend

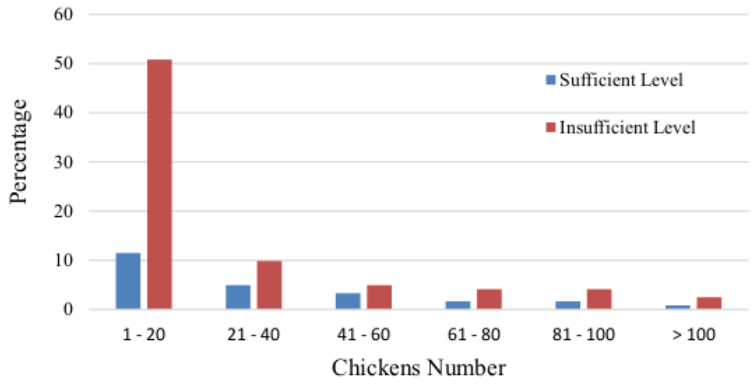

Figure 1. Native Chickens Number and Nutrition Fulfilment in Small Scale Farm Observed in the Villages

The results of statistical analysis as presented in Figure1show that there are significant differences ($P < 0.05$) from six scale livestock numbers connected to the quality of nutrition distributed to the livestock by farmers in rural observed. It is appeared that in general the chickens number in tradition maintenance are smaller than 20 animals and the smallest was around 100 animals, and if these poultry livestock related to the quality of nutrition fulfilment, then this traditional maintenance reared on a small scale generally has poor quality.

Although there has a chicken farm which apply the balance of nutrients in the diet however no guarantee for domestic poultry to be uninfected. Weight gain is not correlated positively with chicken antibody synthesis in the body of the chicken (Erf, 2004 and Parmentier et al., 1996). In our direct field observation in Minahasa region, showed that some farmers have used the good quality of rations for their chickens, but these animals were still infected by various types of pathogenic agents that cause various diseases as well as pullorum, chronic respiratory disease, and coccidiosis. This situation enforced them to use antibiotics or other antimicrobial preparations for the healing of infected chickens. This indicates that the chicken immunity which has good rations does not automatically respective to disease. The maintenance system is generally related to the simple cage systems which lack of air circulation can cause the precipitation of cold winds at night hit the chickens. The infection of pathogen micro-organisms is more easy occur to the animals in this environment (Butcher and Miles, 2012). Therefore this kind of livestock requires the antibodies production in the body that can remove extracellular antigens and can destroy the molecule of antigens. Consequently the chicken can be detached from pathogenic microbial infection. The immune system of chickens after hatching occu[25]hen these animals interact with pathogenic micro-organisms from the environment with increased interleuikin-8 (Crhanova et al., 2011; Bar-Shira et al., 2006).

In generally, the poultry farm with small scale in tropical humid areas has a high level of humidity that is favorable for developing the bacteria and other pathogenic microbes (Roll et al., 2011), which become as the major threat to small scale poultry livestock (Hartel et al., 2000). When these conditions hit the big farms then lead to

large losses as well. Stringfellow et al., 2010). In intensively managed livestock though, although chickens got balanced diet by mixing antibiotics in the ration, chicken deaths due to the disease are not always spared as reported Rumokoy (2013).

The main manifestation of poultry diseases for example: CRD, fowl cholera and pullorum are common appear in small and medium scale poultry farms (Jeffrey et al., 1998).Various reports about avian influenza cases (Clements, 2014; Cucunawangsih, 2006) which attacks poultry farms as happened in Indonesia around year of 2005 really hit the poultry production at all levels both intensively and non- intensive management, even to the impact on human health. To care the chickens' health problems caused by bacteria or other pathogenic micro-organisms, farmers usually use antimicrobials such as antibiotics, sulpha preparations, anticoccidian. The utilization of such substance without careful can affect the quality of meat or eggs product because it is associated with residues that can interfere with consumer safety. To ward off disease, poultry immune systems of humoral and cell - mediated immune (CMI) to eliminate the extracellular antigens and CMI will work specifically against intracellular antigens (Erf, 2004). On the other hand, the durability of these birds can be affected by its ability to cope with extreme ambient temperatures. Fortunately, these types of animals have a body temperature regulation mechanism (Singer, 2007). They must therefore maintain a constant internal temperature (Kay, 1998). This is controlled by extremely precise manner in the central nervous system by a complex nervous and hormonal mechanism. The bird must be a face of situations hyperthermia or hypothermia. In the latter case, it must increase its thermogenesis to offset the increase in heat exchange with the external environment, on the contrary, to very high temperatures, having reached the minimum of its heat production must increase its exchanges with the environment for avoid hyperthermia. The movement of air around the body of the bird will assist in removing heat from the bird as sensible heat (Dingle, 1990).

3.2. The Situation of Native Chicken, Traditionally Maintained

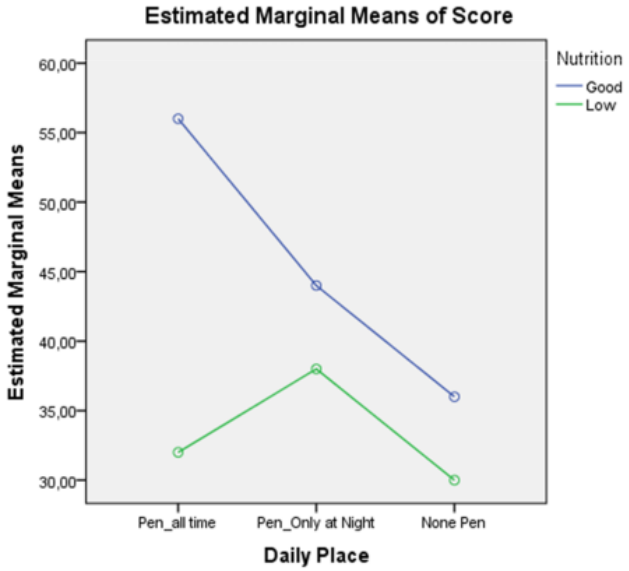

Figure 2. The Proportion Score of Pen Utilisation and Nutrition Level for the Chickens in Extensive Husbandry in the Villages Observed

The pen utilisations and the quality of nutrition distribution for the native chicken life in small-scale husbandry in the village are presented in proportion score as described in Figure 3. There has an interaction significance ($P<0.01$) between daily place and nutrition quality in chicken feed. The scores between 'daily-place' are strongly decreased in the chickens which has no pen utilisation. This character of native chickens husbandry in the villages, which has no pen for daily life of the chickens, is quite dangerous for controlling the disease spread in small -scale chicken farms

in areas with high humidity levels will help to overcome the extra expenditure for the use of drugs. Disease control by using antimicrobial substances should consider the effects of residues in meat and eggs on the health of consumers. The utilisation of antibiotics as growth promoters is oriented to treat infected chickens. Unfortunately, the long term and extensive use of antibiotics for veterinary and productivity purposes may result the resistant microbial species, thereby posing a threat to both animal and human health (Bogaard et al., 2001).

Therefore it is essential to look for other alternatives such as developing an organic chicken production without using drugs or any others antimicrobials substance. This effort can be related to local planting plants containing biomolecules active in stimulating the immune system of poultry, including bio repellent that control the transmitter of disease such the insects. By avoiding the fly as a microbes transmitter to chicken that could support the good health condition (Toar et al., 2013).

3.3. The Main Diseases Found in the Native Chicken, Traditionally Maintained

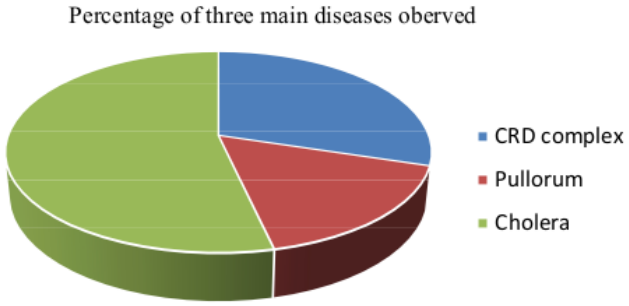

Figure 3. The Three Main Bacterial Diseases Cause the Death that Found in the Native Chickens in the Rural Areas

There were three main bacterial diseases observed during the data collecting in the villages, as shown in Figure 3. The most common diseases that cause the death of chicken are: Fowl Cholera which reached 53%, and then continued respectively by CRD complex for 30% and at least Pullorum for 17%. Those diseases are well know as dangerous diseases in a farm traditionally maintained. Therefore they need to be improved their skill about health care in poultry husbandry for minimizing the disadvantagecomming from infectious diseases. Passive transfer model of immunoglobulin-G in mammalian neonates in traditional conditions with extensive maintenance could an alternative useful to ward off the risk of infection from various microbial pathogens (Rumokoy and Toar, 2014) which is potential appliedto control of non-specific antigen in poultry. The reason is because with this method of passive transfer immunity will not cause negative impact to the consumer health compared to residues of antimicrobial substances utilization. Malik et al., (2006) used imunoglobuline IgYs purified for passive immunization against disease of bursal infectious in chicks. The results of this transfer passive immunity were positive.

4. Conclusion and Recommendation

The situation in developing the small-scale of poultry farms, in the humid tropics area as well as in various regions in Indonesia, is dominated by the local chicken farms. Even though the local resources for animal nutrition are available but they really need a skill to conduct their husbandry production in good manner.

We think that it is urgent to assist the farmer by the government or other institution to train them and to support their effort for being able to increase significantly their poultry production by profiting the local organic resources for the animal of native chickens production, and finally in they turn to take important role in fulfil the chickens meat and eggs for consumers.

Therefore, it is expected these farms can be developed in order to continue to take part in the provision of food in the market for consumers, and in other side it will be good employment and business for its farmers (Prayogi, 2011).

But in fact most of small-scale poultry farmers are not able to continue their business. The main reason of their failure is due to their helplessness in dealing with the problems of diseases which force them to leave the activity. In the next time they try again with the same style of business. Therefore attention and participation from various parties to assist small-scale farmers is crucial in order to improve their skills and to increase the productivity of farm activities.

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